

Maths

For The Primary Stage



6 th.

Primary

Lessons

First Term 2018

UNIT 1

Ratio

- *Meaning of the Ratio*
- *Properties of ratio*
- *Miscellaneous exercises on ratio and its properties*
- *The ratio among three numbers*
- *Applications on ratio (The rate)*

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Lesson 1 Meaning of the Ratio

Ratio

The ratio is a method to compare between two numbers or two quantities of the same type and of the same unit by division.

The ratio between two numbers = $\frac{\text{the first number}}{\text{the second number}}$

Example. the ratio of squares to triangles in the illustration below.



Ratios can be written in several different ways.

the ratio between squares and triangles

$\frac{3}{4}$ or 3 : 4 or 3 to 4

the ratio between triangles and squares

$\frac{4}{3}$ or 4 : 3 or 4 to 3

$\frac{\text{squares}}{\text{triangles}} = \frac{3}{4}$ ➔ squares = $\frac{3}{4}$ X triangles

$\frac{\text{triangles}}{\text{squares}} = \frac{4}{3}$ ➔ triangles = $\frac{4}{3}$ X squares

The order of terms of the ratio is very important where $3 : 4 \neq 4 : 3$

The ratio between a number and another number

$$= \frac{\text{First number}}{\text{Second number}} \begin{matrix} \leftarrow \text{(first term)} \\ \leftarrow \text{(second term)} \end{matrix}$$

- The ratio is written without any units
- The two terms of the ratio must be with the same unit.
- The ratio has the same properties as fraction.
- You can multiply or divide both the two terms of any ratio by the same number (except zero).
- The rate (average) is a ratio between two quantities of different types.

Example. Find in its simplest form the ratio between :

(a) 1500 and 750 (b) 3.5 : 8.75

Solution

(a) the ratio = 1500 : 750 ÷10
= 150 : 75 ÷5
= 30 : 15 ÷5
= 6 : 3 ÷3
= 2 : 1

(b) the ratio = 3.5 : 8.75 X 100
= 350 : 875 ÷5
= 70 : 175 ÷5
= 14 : 35 ÷7
= 2 : 5

Find in its simplest form the ratio between :

[a] 48 : 18

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[b] 2800 : 3500

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[c] 1.4 : 42

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[d] 3.15 : 6.3

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Very important notes The ratio between :

[a] the side length of the square and its perimeter $= 1 : 4$

the perimeter of the square and its side length $= 4 : 1$

[b] the side length of equilateral triangle and its perimeter $= 1 : 3$

the perimeter of equilateral triangle and its side length $= 3 : 1$

[c] the diameter length of the circle and its circumference $= 2r : 2\pi r = 1 : \pi$

the circumference of the circle and its diameter length $= \pi : 1 = \pi$

[d] the radius length of the circle and its circumference $= r : 2\pi r = 1 : 2\pi$

the circumference of the circle and its radius length $= 2\pi : 1 = 2\pi$

Example Find in its simplest form the ratio between :

(a) $2\frac{1}{4} : \frac{1}{2}$ (b) $3\frac{1}{2} : 10.5$

Solution

(a) $2\frac{1}{4} : \frac{1}{2}$

$\frac{9}{4} : \frac{1}{2}$ $\times 4$

$\frac{9}{4} \times 4 : \frac{1}{2} \times 4$

$9 : 2$

(b) $3\frac{1}{2} : 10.5$

$3.5 : 10.5$ $\times 10$

$35 : 105$ $\div 5$

$7 : 21$ $\div 7$

$1 : 3$

Find each of the following ratios in its simplest form :

[a] $\frac{5}{7} : \frac{3}{4}$ [b] $1\frac{2}{3} : 2\frac{1}{2}$ [c] $\frac{3}{8} : 2\frac{1}{4}$ [d] $1\frac{1}{4} : 1.75$

Solution

[a] $\frac{5}{7} : \frac{3}{4}$

[b] $1\frac{2}{3} : 2\frac{1}{2}$

[c] $\frac{3}{8} : 2\frac{1}{4}$

[d] $1\frac{1}{4} : 1.75$

Example.

Ahmed had LE 500 , he spent LE 350 and save the rest. find :
(a) The ratio between the money he spent and the money that he saved.
(b) The ratio between the money he spent and the total money .
(c) The ratio between the money he saved and the total money .

Solution

(a) The saved money = 500 - 350 = 150 LE

The ratio = spent : saved
350 : 150
35 : 15 ÷ 5
7 : 3

$$\frac{\text{spent}}{\text{saved}} = \frac{7}{3} \qquad \text{spent} = \frac{7}{3}\ \text{saved}$$

(b) The ratio = spent : total
350 : 500
35 : 50 ÷ 5
7 : 10

$$\frac{\text{spent}}{\text{total}} = \frac{7}{10} \qquad \text{spent} = \frac{7}{10}\ \text{total}$$

(c) The ratio = saved : total
150 : 500
15 : 50
3 : 10

$$\frac{\text{saved}}{\text{total}} = \frac{3}{10} \qquad \text{saved} = \frac{3}{10}\ \text{total}$$

The total number of boys and girls in a school is 480 and the number of boys in this school is 320 . find

a) The ratio between the number of boys and that of girls

b) The ratio between the number of boys and the total number of pupils .

c) The ratio between the number of girls and the total number of pupils .

d) Complete :

the number of boys = $\frac{....}{....}$ the number of girls .

the number of girls = $\frac{....}{....}$ the total number of pupils.

Solution

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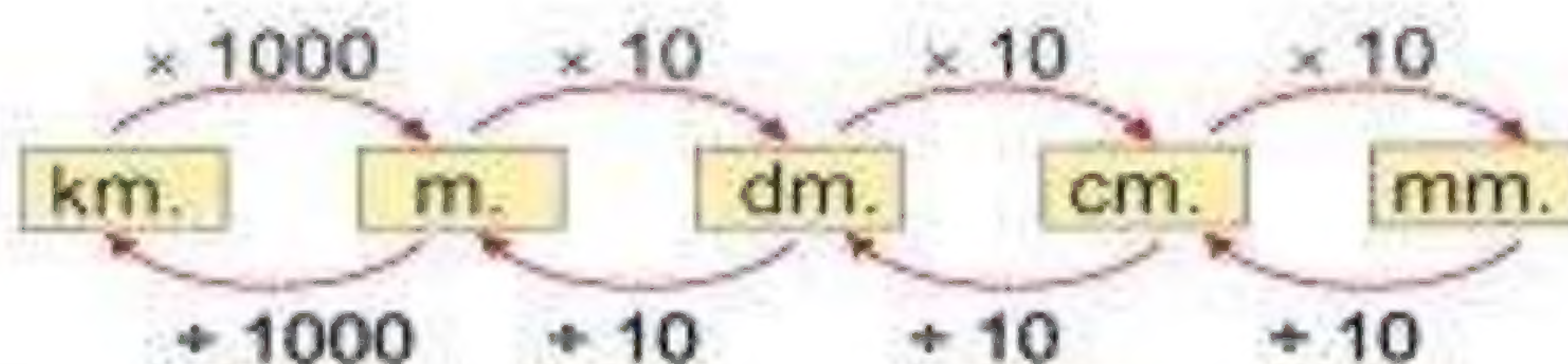
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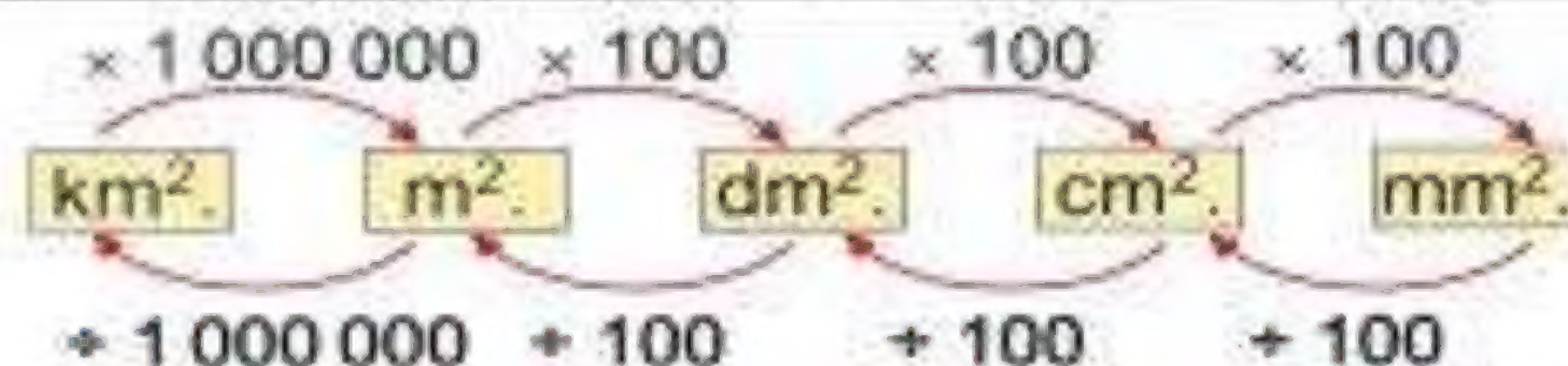
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Lesson 2 Properties of the Ratio

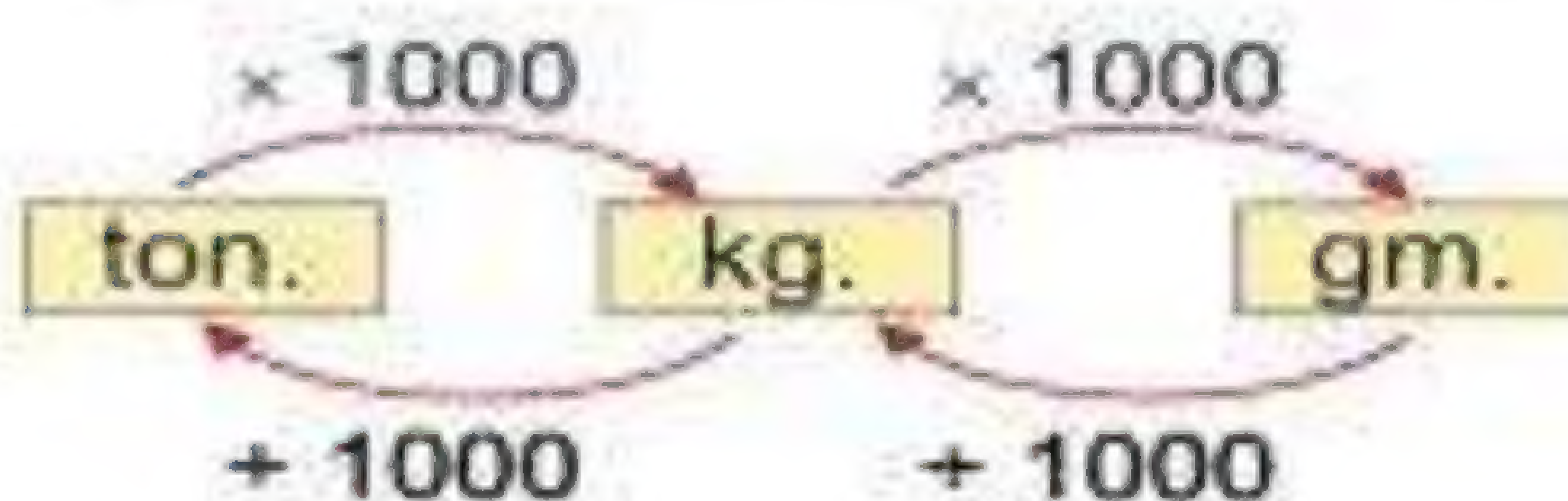
The length units



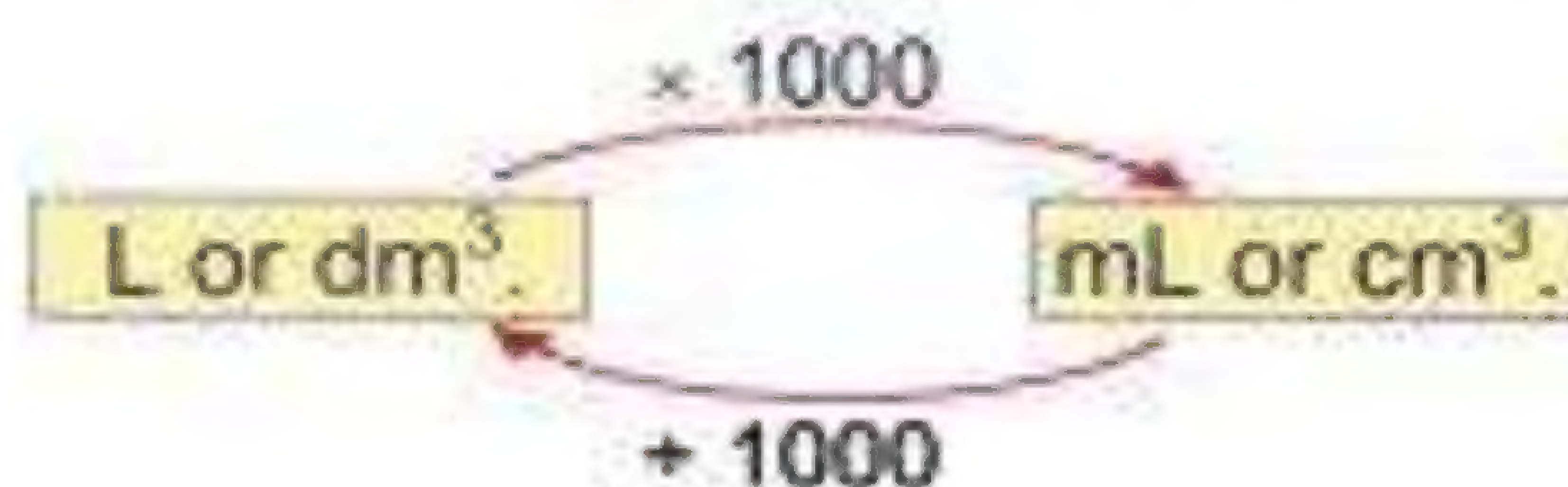
The area units



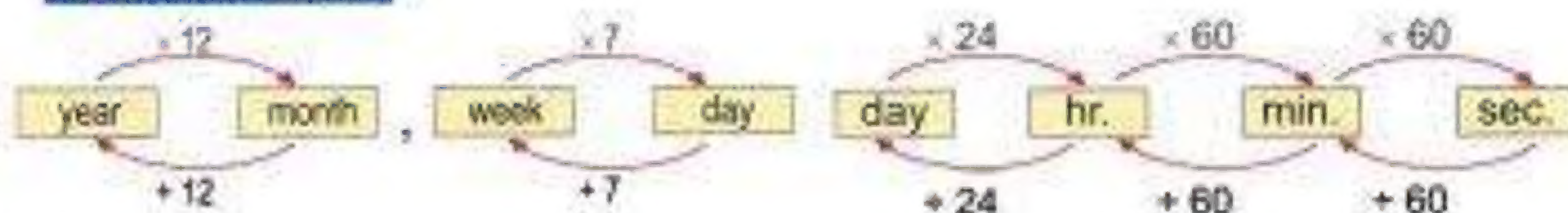
The weight units



The capacity units



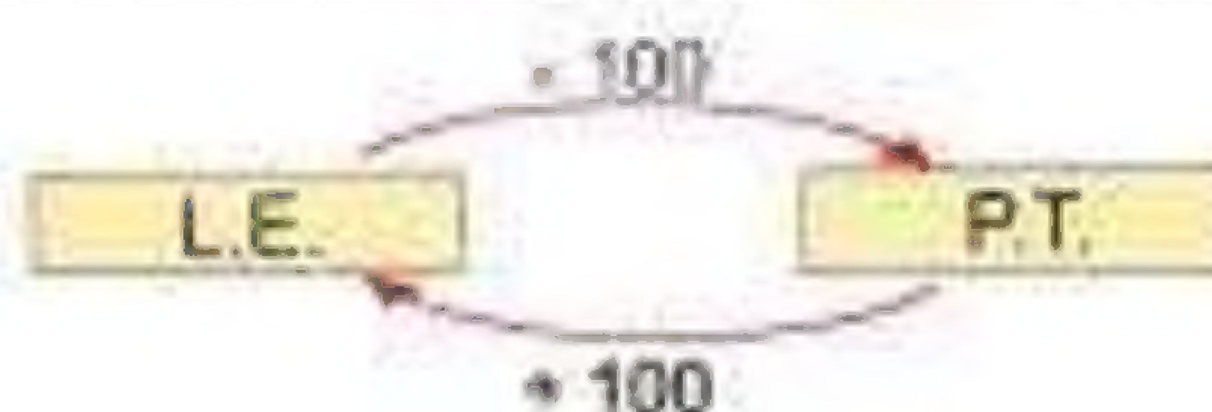
The time units



Units of cultivated lands



The money units



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Example.

Find in the simplest form the ratio between:
(a) 3.5 hours and 140 minutes
(b) 1600 ml and 8 liters .

Solution

(a) 3.5 hours = 3.5 X 60 = 210 minutes

The ratio = 3.5 hours : 140 minutes
= 210 : 140
= 21 : 14 ÷ 7
= 3 : 2

(b) 8 liters = 8 X 1000 = 8000 mL

the ratio = 1600 mL : 8 L
= 1600 : 8000
= 16 : 80 ÷ 8
= 2 : 10 ÷ 2
= 1 : 5

Find each of the following ratios in its simplest form :

[a] 50 cm. : 1.5 m.
[b] 3 years : 18 months
[c] 12 kirats ; 1.25 feddan.
[d] P.T. 630 : L.E. 9

(a) 50 cm. : 1.5 m.

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(b) 3 years : 18 months

(c) 12 kirats : 1.25 feddan

(d) P.T. 630 : L.E. 9

Remember that

1. The area of the triangle = $\frac{1}{2}$ × the base length × the height

   i.e. $A = \frac{1}{2} \times b \times h$

2. The area of the parallelogram = the base length × the height

   i.e. $A = b \times h$

3. The area of the rhombus = the side length × the height

   i.e. $A = \ell \times h$ or $A = \frac{1}{2} \times d_1 \times d_2$

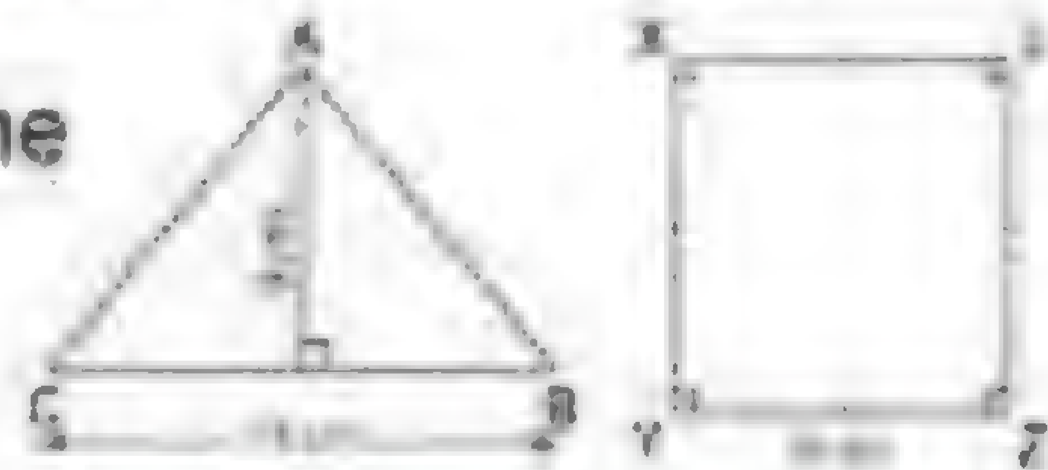
   Where d_1 and d_2 are the lengths of its two diagonals.

Example.

By using the opposite figure, find the ratio between

The area of the triangle ABC : the

area of the square XYZL



Solution

The area of the triangle ABC = $\frac{1}{2}$ X base X height

= $\frac{1}{2}$ X 16 X 9 = 72 cm^2

The area of the square XYZL = side length X side length

= 9 X 9 = 81 cm^2

The ratio = area of triangel ABC : area of square XYZL

= 72 : 81 ÷ 9

= 8 : 9

Find in the simplest form the ratio between :

The circumference of the circle whose radius length is 10.5 cm. and the perimeter of a square whose side length is 7.5 cm.

Lesson 3 miscellan eous exercises on ratio and its properties

Example

The ratio between the number of boys and that of girls in a school is 9 : 7 . If the number of boys is 378. Find the number of girls .

The solution

Boys : Girls

9 : 7

378 : ?

$$\text{the number of girls} = \frac{\overset{42}{\cancel{378}} \times 7}{\underset{1}{\cancel{9}}} = 294 \text{ girls .}$$

If the ratio between the number of pupils in grade 5 an that in grade 2 is 4 : 7 if the number of pupils in grade 5 is 160 pupils Find the number of pupils in grade 2 .

Solution

Example

A piece of wire 300 cm long is divided in the ratio 2 : 3
A square and a triangle were formed from the two pieces respectively . Find the side length of each

The solution

	Square	:	Triangle	:	total
The ratio	2	:	3	:	5
The perimeter	x	:	y	:	300

The perimeter of the square = $\frac{2 \times 300}{5}$ = 120 cm

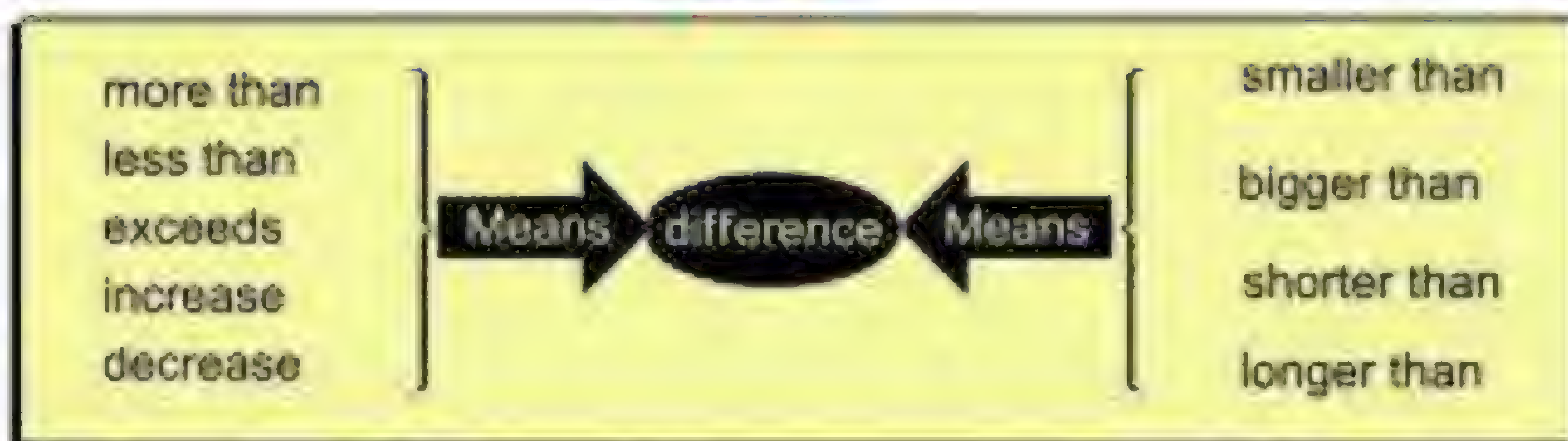
The side length of square = 120 ÷ 4 = 30 cm

The perimeter of the triangle = $\frac{3 \times 300}{5}$ = 180 cm

The side length of the triangle = 180 ÷ 3 = 60 cm

If the ratio between the money that Ayman saved and that Amr saved was 6 : 8 .If the total money that Ayman and Amr saved was LE 70 . Find the money that each of them saved

Solution



Example

The ratio between Karim's weight and Eman's weight is 3 : 5 If the difference between their weights is 20 kg., find the weight of each of them.

Karim	:	Eman	:	Difference
3	:	5	:	2
x	:	y	:	20

Karim's weight = $\frac{3 \times 20}{2}$ = 30 kg.

Eman's weight = $\frac{5 \times 20}{2}$ = 50 kg.

The ratio between the length of two pieces of cloth is 5:9
If the difference between their length is 4.8 m .
Find the length of each piece .

Solution

A rectangular piece of land of perimeter 660 m.
If the ratio between its width and its length is 5 : 6 , find :

a Its length and its width. **b** Its area.

Solution

24 kilograms of butter were made margarine, The ratio between the weight of margarine and the weight of butter is 5:6 Find the weight of margarine.

Solution

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Lesson 4 The ratio among three numbers

Ahmed is 12 years old , Nada is 9 years old and Rana is 18 years old . Find the ratio between their ages.

The solution

	Ahmed	:	Nada	:	Rana	
	~~12~~	:	~~9~~	:	~~18~~	÷ 3
The Ratio is	4	:	3	:	6	

Put each of the following ratios in its simplest form :

[a] 36 : 48 : 84

[b] $1.25 : 5 : 1\frac{1}{2}$

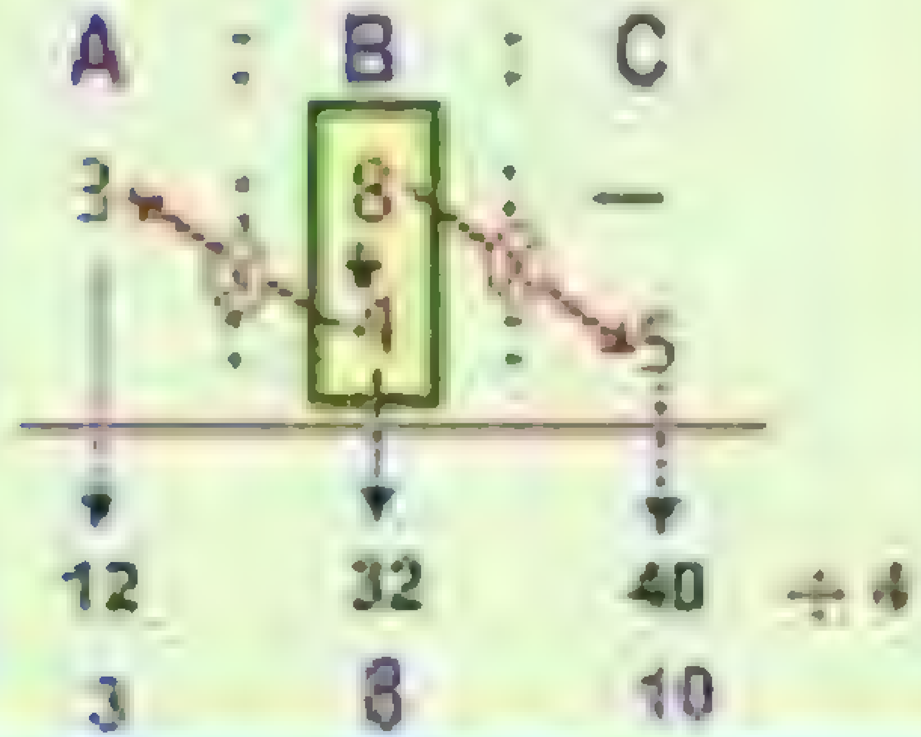
[c] 3.2 m. : 80 cm. : 24 dm.

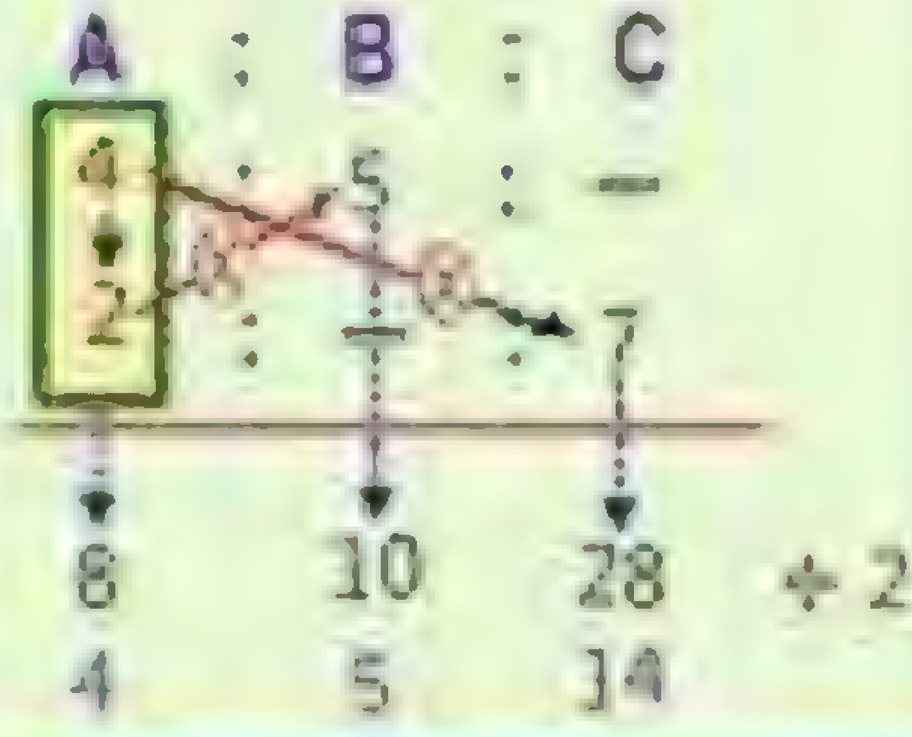
3.2 m = ……………………

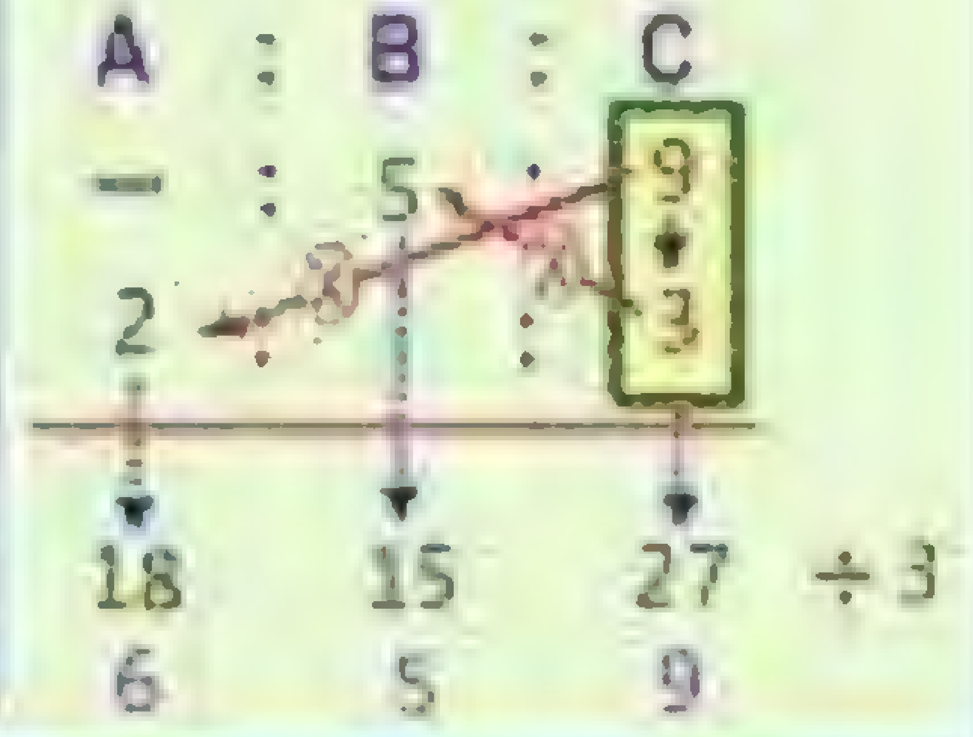
24 dm = ……………………

The Ratio = ……………………

Example Find the ratio (A : B : C) if :







Find the ratio (A : B : C) if :

a) A : B = 3 : 4 and B : C = 2 : 3

A : B : C

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b) A : C = 2 : 9 and B : C = 2 : 6

A : B : C

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c) A : B = 3 : 5 and A : C = 6 : 7

A : B : C

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Choose the correct answer between brackets :

a If A : B = 2 : 3 and B : C = 3 : 5 , then A : C = ...

(3 : 4 or 3 : 12 or 2 : 5 or 3 : 5)

b If A : B = 2 : 3 and B : C = 12 : 7 , then A : C = ...

(2 : 7 or 3 : 7 or 8 : 7 or 3 : 12)

c If a : b = $\frac{2}{3}$ and b : c = 3 : 5 , then a : c = ...

(2 : 3 or 6 : 5 or 2 : 5 or 5 : 6)

d If a : b = 3 : 5 and b : c = 2 : 5 , then a : b : c = ... : .... : ....

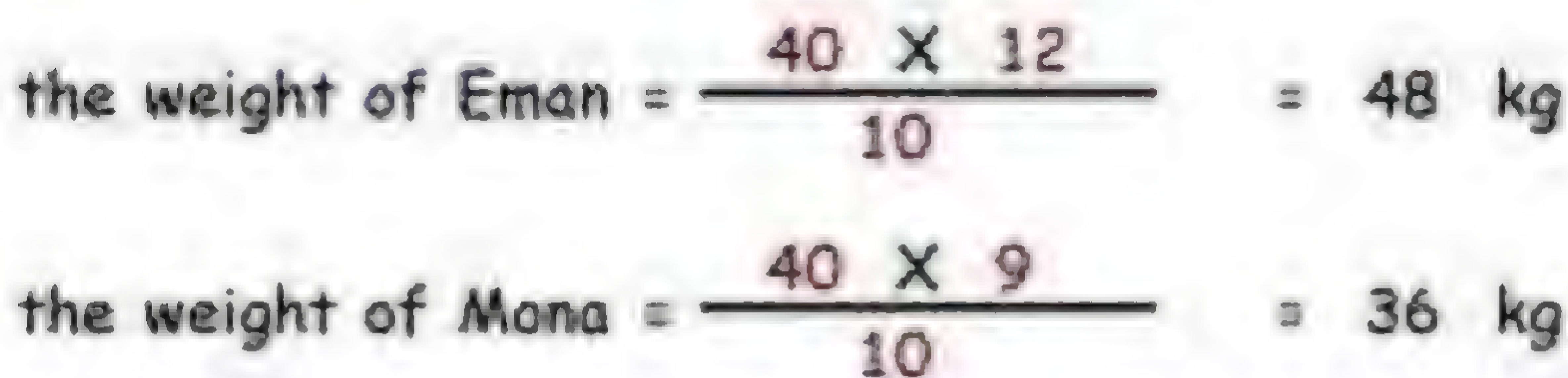
(3 : 2 : 5 or 6 : 10 : 25 or 6 : 2 : 5 or 5 : 10 : 6)

Example

The ratio between the weight of Alaa and Eman is 5 : 6 and
The ratio between the weight of Mona and Eman is 3 : 4 ,
If the weight of Alaa is 40 kg .
Find the weight of Eman and Mona .

The solution

	Alaa	:	Eman	:	Mona
	5	:	6	:	
		:	4	:	3
	~~20~~	:	~~24~~	:	~~18~~
the ratio	10	:	12	:	9
the weight	40	:	x	:	y



$$\text{the weight of Eman} = \frac{40 \times 12}{10} = 48 \text{ kg}$$

$$\text{the weight of Mona} = \frac{40 \times 9}{10} = 36 \text{ kg}$$

The ratio between the money that Ezzat has to Sobhy To Medhat is 12 : 15 : 25 If Medhat has LE 600 .
Find the money that each of Ezzat and Sobhy has .

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Example

The ratio between the angles of a triangle is 3 : 7 : 8
Find the measure of each angle .

The solution

1 st. angle = $\frac{3 \times 180}{18} = 30^{\circ}$

2 nd. angle = $\frac{7 \times 180}{18} = 70^{\circ}$

3 rd. angle = $\frac{8 \times 180}{18} = 80^{\circ}$

1 st.	2 nd.	3 rd.	total
3	7	8	18
x	y	z	180

The ratio between the ages of Mona , Sara and Hoda is 5:6:4
If the difference between the ages of Sara and Hoda is 4years
Find the age of each .

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The radius length of two circles are 14 cm and 70 cm .
Calculate the ratio between their circumference .

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Lesson 5 Application on ratio (The rate)

Definition

The ratio between two quantities of different kinds

The unit of rate is
the unit of the first quantity per each unit of the second quantity .

Example

If a car coverd 180 kilometer within 3 hours then
the speed of this car = 180 ÷ 3 = 60 km/ hour

The solution

The speed (60 km/ hour) is called the Rate(average)

Hassan spends LE 45 within three days
what is the rate of what Hassan spends per day?

A car consumes 20 litre of Benzin to cover a distance 250km.
Calculate the rate of consumption of the car to Benzin.

A plough for agricultural land, ploughs 6 feddans within 3 hours. another plough, ploughs 10 fedan within 4 hours. Which of them is better than the other.

A tractor ploughs 15 feddans in 5 hours.
How many feddans does the same tractor plough in 4 hours ?

UNIT 2

Proportion

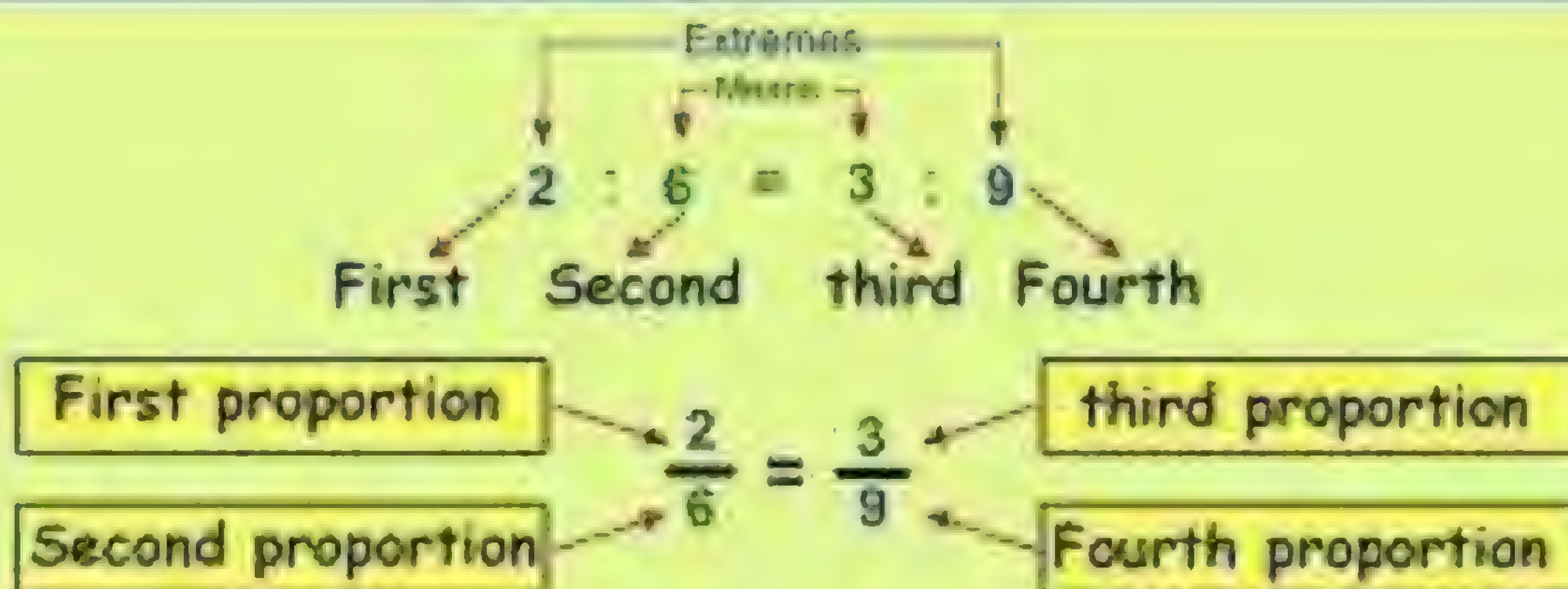
- The meaning of proportion
- Properties of proportion
- Drawing Scale
- The proportional division
- Percentage
- Applications on the percentage

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Lesson 1&2 Meaning of proportion

Properties of proportion

The proportion is the equality of two ratios or more.



$$\frac{2}{6} = \frac{3}{9}$$

The product of (means) = The product of (extremes)

3 x 6 = 2 x 9 (Cross multiplication)

18 18

(extremes) : first and fourth proportion

(means) : second and third proportion

Complete the missing number to form a proportion :

4	5	6	...Z...	...L...
20	...X...	...Y...	40	45

The solution

X = ... Z = ...

Y = ... L = ...

4	5	6	....	....
20	....	....	40	45

Find the value of X in each of the following :

a) $\frac{3}{5} = \frac{X}{15}$ b) $\frac{X}{15} = \frac{4}{20}$ c) $\frac{6}{X} = \frac{16}{48}$

The solution

a) ....

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b) ....

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c) ....

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find the missing term in each of the following for the numbers to be proportional

a) 4 , 5 , 8 , ... b) 12 , 16 , ... , 8 c)...... , 8 , 12 , 24

The solution

a) ....

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b) ....

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c) ....

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Complete the following proportion:

$$\frac{1}{\ldots} = \frac{3}{\ldots} = \frac{5}{10} = \frac{\ldots}{8} = \frac{\ldots}{28}$$

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Example.

Ali bought 5 kg of orange, he paid LE 15 .
How much money does he pay to buy 8 kg?

The solution

The weight in (KG)	5 kg	8 kg
The the price in (LE)	15 LE	x LE

$$\text{The price of 8 kg} = \frac{15 \times 8}{5} = 24 \text{ LE}$$

A car consumms 20 litre of Benzin for covering 210 km,
How many litre of Benzin does the car consumm to cover 630 km.

The solution

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The price of 12 litres of liquid soap is LE 6, Find

a) The price of 48 litres of the same soap.

b) Number of litres of price LE 9.

The solution

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Lesson 3 Drawing Scale

Drawing Scale

the ratio between the drawing length and the real length and this ratio is

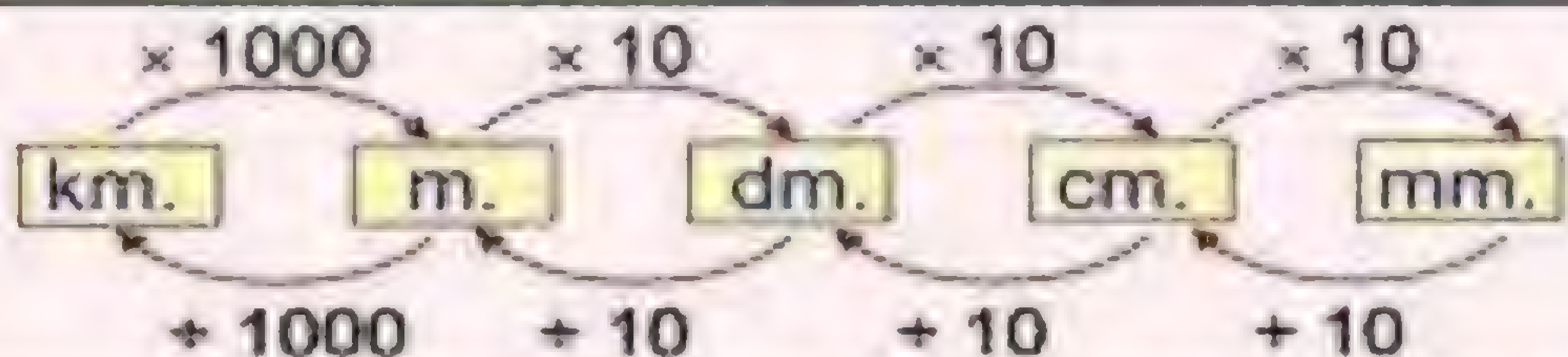
$$\text{Drawing scale} = \frac{\text{Length in drawing}}{\text{Length in reality}}$$

Both lengths should have the same units.

If the drawing scale is

- Less than 1 (< 1) → then it refers to minimization (reduction) for example : maps and geometric figures.
- Greater than 1 (> 1) → then it refers to enlargement (magnification) for example : a picture for a small insect.

The length units



The real length
- mm → Small insects
- cm → Human
- m → Buildings and trees
- km → the cities

Example

The distance between two cities is 80 km. and the distance between them on a map is 8 cm. Find the drawing scale and what it means.

The solution

80 km. = 80 × 100 000 = 8 000 000 cm.

The drawing scale = drawing : real

= 8 : 8 000 000

= 1 : 1 000 000

A magnified picture of an insect of real length 0.5 mm. was photographed.
If the length of this insect in the picture = 7.5 cm. , calculate the drawing scale

7.5 cm. = ... = ... mm.

The drawing scale = drawing : real

= .... : ....

= .... : ....

= .... : ....

Example

The distance between two cities on a map is 3.6 cm.
and the map was drawn with a drawing scale 3 : 5 000 000
Find the real distance between the two cities in kilometres.

The solution

The drawing scale = drawing : real

3 : 5 000 000

3.6 cm. : X

the real distance = $\frac{3.6 \times 5\ 000\ 000}{3}$ = 6 000 000 cm.

= 6 000 000 ÷ 100 000 = 60 kilometres.

The real distance between two cities is 24 km. If the drawing scale of a map is 1 : 400 000 , find the map distance between these two cities on this map in cm.

The drawing scale = drawing : real

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the map distance = ―――――― = ... kilometres.

= .... = ... cm.

A building was pictured by a scale 1 : 1000 , the height of this building in the picture is 8 cm. Find the real height of this building

The drawing scale = drawing : real

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the real height = ―――――― = ...

= .... = ...

A map is drawn with a scale 1 : 250 000 If the distance between two cities on this map is 4.8 cm. , then find the map distance between these two cities on another map with a scale 3 : 500 000

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A model for a football playground is drawn with a drawing scale 1 : 500. The dimensions of the playground in the model are 24 cm and 10 cm. Find the area of this playground in square metres.

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A picture was enlarged such that each 0.5 cm of the old picture becomes 20 cm in the new picture. What is the ratio of enlargement ?

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Lesson 4 'roportional Division

Example

Distribute 154 orange in 2 boxes in the ratio 5 : 6.

The solution

$1^{st.}$ box : $2^{nd.}$ box : sum

5 : 6 : 11

x : y : 154

$1^{st.}$ box $= \frac{5 \times 154}{11} = 70$ orange

$2^{nd.}$ box $= \frac{6 \times 154}{11} = 84$ orange

Another Solution

$1^{st.}$ box : $2^{nd.}$ box

5 : 6

The sum of parts = 5 + 6 = 11 parts

The value of each part = 154 ÷ 11 = 14 oranges

$1^{st.}$ box = 5 X 14 = 70 oranges

$2^{nd.}$ box = 6 X 14 = 84 oranges

Distribute 54 booklets among 3 students in the ratio 2 : 3 : 4.

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Divide LE 420 among 3 persons that the share of the first is $\frac{1}{2}$ of that of the second, and the share of the second is $\frac{1}{2}$ of the share of the third.

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A man died leaving 192 feddans of land to be distributed among his wife, 2 sons and 3 daughters. The share of the wife is $\frac{1}{8}$ of the whole land , and the share of the son is twice that of the daughter. Find the share of the wife and of each of the sons and daughters.

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Partnership

Example

Siham , Sherief and Magdy started a business,
Siham paid L.E. 5000, Sherief paid L.E. 3000 and
Magdy paid L.E. 4 000 At the end of the year
, the sum of the shares of Sherief and Magdy was L.E. 1 610
Find the share of each one.

The solution

Siham	:	Sherief	:	Magdy
5000	:	3000	:	4 000
5	:	3	:	4

Siham	:	Sherief	:	Magdy	:	sum
5	:	3	:	4	:	7
x	:	y	:	z	:	1 610

the share of Siham $= \frac{5 \times 1\,610}{7} = 1\,150$ L.E.

the share of Sherief $= \frac{3 \times 1\,610}{7} = 690$ L.E.

the share of Magdy $= \frac{4 \times 1\,610}{7} = 920$ L.E.

Three people started a trade business. In the ratio 3:5:6 .
AT the end of the year, the profit was LE 2100.
Find the share of each person in the profit.

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Three partners established a business. The first paid LE 7000 , the second paid LE 5000 and the third paid LE 9000. After one year the share of the first in the profit was LE 1925.Find out the share of the second and the third in the profit.

Aly, Hamed and Salah paid LE 3500 , LE 4500 and LE 6000 to set up a trade, at the end of the year the Salah profited LE 150 more than Hamed .

Find out the share of each of them in the profit

Hesham, Metwally and Hamed shared in a project. Hesham paid $\frac{2}{3}$ as much as Metwally, Metwally paid $\frac{3}{4}$ as much as Hamed. At the end of the year Metwally profited LE 150 less than Hamed.

Find the share of each in the profit.

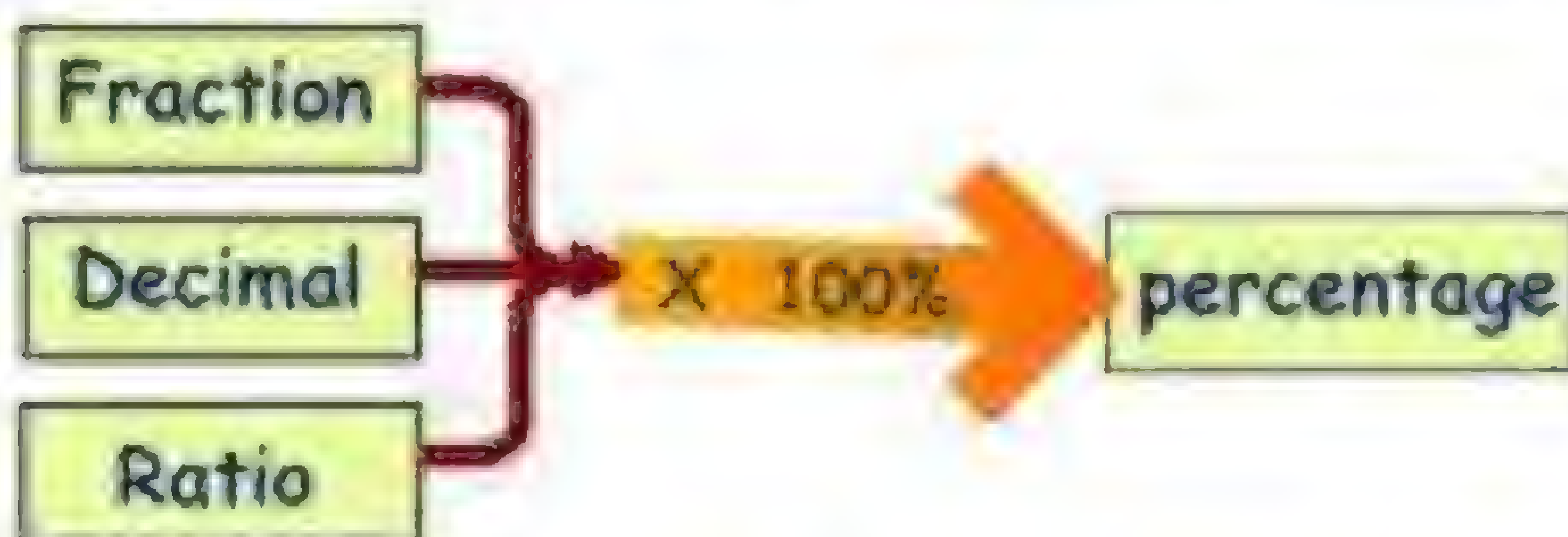
Lesson 5 Percentage

The percentage is a ratio with second term = 100

The ratio 35 : 100 is called a percentage because its second term is 100 and it can be written as (35%) and is read as (35 percent).

$35\% = \frac{35}{100}$, then we can deduce that :

- $100\% = \frac{100}{100} = 1$
- 100% of a quantity denotes the whole quantity.



Example

$\frac{3}{4} = \frac{3}{4} \times 100\% = 75\%$

$0.75 = 0.75 \times 100\% = 75\%$

$3 : 4 = \frac{3}{4} = \frac{3}{4} \times 100\% = 75\%$

Converting a common fraction to a percentage :

Convert each of the following fractions to a percentage :

[a] $\frac{2}{5}$ [b] $\frac{8}{25}$ [c] $\frac{3}{8}$ [d] $\frac{5}{8}$

[a] ....

[b] ....

[c] ....

[d] ....

Converting a decimal to a percentage :

Convert each of the following decimals to a percentage :

[a] 0.37 [b] 0.099 [c] 0.3 [d] 0.625

[a] ……………………………………………

[b] ……………………………………………

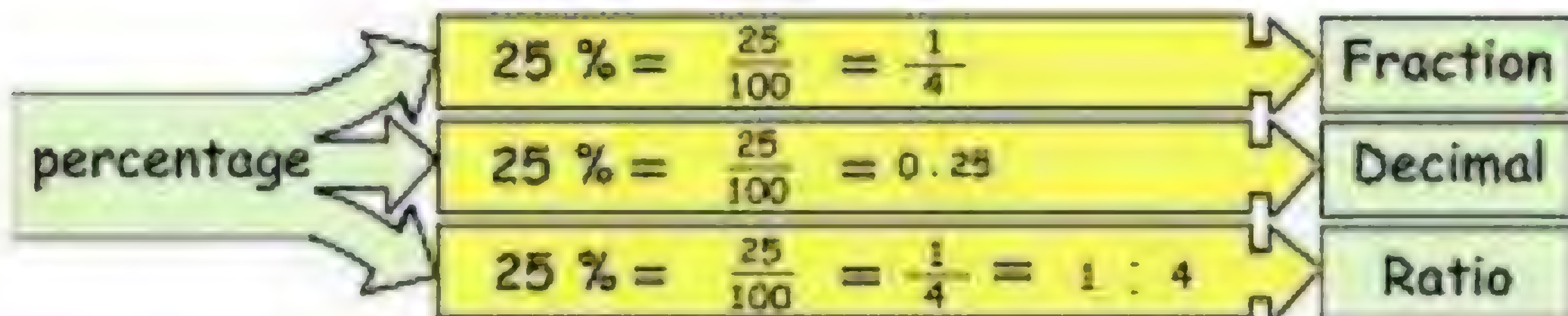
[c] ……………………………………………

[d] ……………………………………………

Put each of the following ratios in its simplest form , then convert each one to a percentage : [a] 35 : 50 [b] $\frac{2}{3} : \frac{5}{6}$

[a] ……………………………………………

[b] ……………………………………………



Converting a percentage to a common fraction :

Convert each of the following percentages to a common fraction in its simplest form : [a] 27% [b] 80% [c] 7% [d] 25%

[a] 27% = ……………………………………………

[b] 80% = ……………………………………………

[c] 7% = ……………………………………………

[d] 25% = ……………………………………………

Converting a percentage to a decimal :

Convert each of the following percentages to a decimal :

[a] 1.5% [b] 4.2% [c] $16\frac{1}{5}$% [d] $12\frac{1}{4}$%

[a] ....

[b] ....

[c] ....

[d] ....

Example

Complete

(a) 15% of 400 = ... (b) 25% of .... = 150

(c) .... % of 180 = 54 (d) 0.35 + 20% + $\frac{1}{4}$ = ... %

Solution

(a) 15% of 400 = 60

$\frac{15}{100} \times 400 = 60$

(b) 25% of 600 = 150

$\frac{25}{100} \times .... = 150$

$x = 150 \div \frac{25}{100} = 600$

(c) 30 % of 180 = 54

$\frac{54}{180} \times 100\% = 30\%$

(d) 0.35 + 20% + $\frac{1}{4}$ = 80 %

35% + 20% + 25% = 80 %

Find the value of each of the following :

[a] 12% of 500 kg. [b] 40% of L.E. 800

[a] ....

[b] ....

Complete each of the following :

[a] If the percentage of success in a school is 76% , then the percentage of failures is .... %

[b] 1 – (15% + 55%) = ... %

[c] 70% + 12% + ... % = 98%

[d] 15% of 540 = ... [e] 32% of 300 gm. = ...

[f] 5% of .... = L.E. 20 [g] 2% of .... = 24

[h] If the percentage of boys in a school is 62% , then the percentage of girls is .... %

Find the value of x in each of the following :

a $\frac{x}{8} = 25\%$ ....

b $\frac{x-2}{100} = 15\%$ ....

....

c $\frac{3x}{2} = 75\%$ ....

....

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Example

Nada spent 60% of the money and save the rest.
Find the percentage of the saved money

The solution

the percentage of the saved money $100\% - 60\% = 40\%$

If the percentage of the number of girls in a class which is mixed is 63%, find the percentage of the number of boys in this class.

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Example

Nada had LE 400 . she spent LE 360 and save the rest.
Find the percentage of the saved money

The solution

The saved money = 400 - 360 = 40 LE

The percentage of the saved money = $\frac{40}{400} \times 100\% = 10\%$

A basket contains 48 balls such that 30 balls are red and the rest are white.

Find the percentage of each kind.

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There are 250 pupils in a school , 15 pupils of them were absent one day.

Find the percentage of absentees on that day.

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Example

Nada had LE 400 . she spent 80% of the money and save the rest.
Find the saved money

The solution

the money she spent = $\frac{80}{100} \times 400 = 320$ LE

the saved money = $400 - 320 = 80$ LE

Another solution :

the percentage of saved money = 100% - 80% = 20%

the saved money = $\frac{20}{100} \times 400 = 80$ LE

The number of pupils in a school is 720 One day , 7.5% of them were absent.
Find the number of the present pupils that day

600 pupils were tested in an examination , 75% of them succeeded.
Find the number of pupils who failed.

Example:

Nada spent 60% of her money . if the money she spent is 120 LE.
Find the total money was with her .

The solution

$$\text{The total momey} = 120 \div 60\% = 120 \div \frac{60}{100}$$

$$= 120 \times \frac{100}{60} = 200 \text{ LE}$$

The percentage of absent pupils in a primary school one day was 1.5%
If the number of absent pupils was 30 pupils , find the whole number of pupils in this school.

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The percentage of boys in a class is 60% . if the number of girls is 16 . find the number of boys .

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Lesson 6 Application on the percentage

selling price (S.P.) cost price (C.P.) Profit Loss expenditures

Profit = selling price (S.P.) – cost price (C.P.)

The percentage of profit = $\frac{\text{Profit}}{\text{C.P.}} \times 100\ \%$

Loss = cost price (C.P.) – selling price (S.P.)

The percentage of loss = $\frac{\text{Loss}}{\text{C.P.}} \times 100\ \%$

The cost price = buying price + expenditures (where expenditures may be maintenance , transportation , insurance , rentals , ... etc.)

Example

Eman bought a car for LE 30 000 then , she sold it for LE 28 500 . Find the percentage of her loss.

The solution

C.P. = 30 000
S.P. = 28 000
Loss = ?
Loss% = ?

Loss = 30 000 - 28 500 = 1500 LE

The percentage of her loss

$$= \frac{1500}{30\,000} \times 100\% = 5\ \%$$

Example

Ahmed bought a house for LE 50 000 and spent LE 4000 to repair it . then he sold this house for LE 59 400.
Find the percentage of his profit.

The solution

B.P = 50 000
Exp. = 4000
C.P. = ??
S.P. = 59 400
Profit = ?
Profit% = ?

Cost price = 50 000 + 4 000 = 54 000 LE

The profit = 59 400 - 54 000 = 5 400 LE

The percentage of profit

$$= \frac{5\,400}{54\,000} \times 100\ \% = 10\%$$

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A shopkeeper bought a TV set for L.E. 1 440 and sold it for L.E. 1 800
Find his profit and the percentage of it.

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A man bought an old house for L.E. 225 000. He spent L.E. 45 000 to repair it. He sold it for L.E. 240 000. Find his percentage of loss.

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Example

Ahmed bought a house for LE 50 000 and spent LE 10 000 to repair it . then he sold this house with profit 5% .
Find the profit and the selling price of the house .

The solution

B.P = 50 000
Exp. = 10000
C.P. = ??
S.P. = ??
Profit = ?
Profit% = 5 %

The cost price = 50000 + 10000 = 60000 LE

C.P.	Profit	S.P.
100	5	105
60000	x	y

The Profit = $\frac{60000 \times 5}{100}$ = 3000 LE

The selling price = $\frac{60000 \times 105}{100}$ = 63 000 LE

Another Solution

The cost price = 50000 + 10000 = 60000 LE

The Profit = $\frac{5}{100} \times 60000$ = 3000 LE

The selling price = 60000+3000 = 63 000 LE

Example

A man sells TV for LE1900. if the percentage of his loss is 5% . Find the buying price of TV.

The solution

C.P.	:	loss	:	S.P.
100	:	5	:	95
x	:	—	:	1900

C.P. = ??
S.P. = 5200
loss = ?
loss% = 5 %

buying price of TV. $\frac{1900 \times 100}{95}$ = 2000 LE

Another Solution

The percentage of selling price = 100% - 5% = 95 %

The buying proce of TV = 1900 ÷ 95% = 1900 X $\frac{100}{95}$ = 200 LE

The selling price of some goods was L.E. 1 475 , if the merchant sold it at a profit of 18 % , then find : [a] The cost price. [b] The profit.

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A man bought a washing machine for L.E. 4 600 and spent L.E. 400 to repair it. He sold it with loss of 16 % of the cost price.

Find the selling price and his loss in L.E.

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A sheep merchant bought a ram for L.E. 436 and he spent L.E. 64 on feeding it. If he sold the ram at a profit of 12.5 % , then find its selling price.

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Butter gives 80 % of its weight as margarine :

[a] Find the weight of margarine extracted from 50 kg. of butter.

[b] Find the weight of butter which contains 48 kg. of margarine.

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Example

The price of a car is LE 90 000 . if the discount is 2% of its original price, Find the price after dicount.

The solution

Before discount	:	discount	:	After discount
100	:	2	:	98
90 000	:	--	:	x

The price after discount = $\frac{90\,000 \times 98}{100}$ = 88 200 LE

A man bought a TV set. He was given a 5 % discount of its marked price which was L.E. 850. ***Find its discount price.***

Maha bought an electric device for L.E. 1995 after having a 5% discount. ***Find the original price of the device***

Hany deposited L.E. 5 000 in a bank with an interest of 9.5 % yearly. ***Find the total amount that Hany got at the end of the year.***

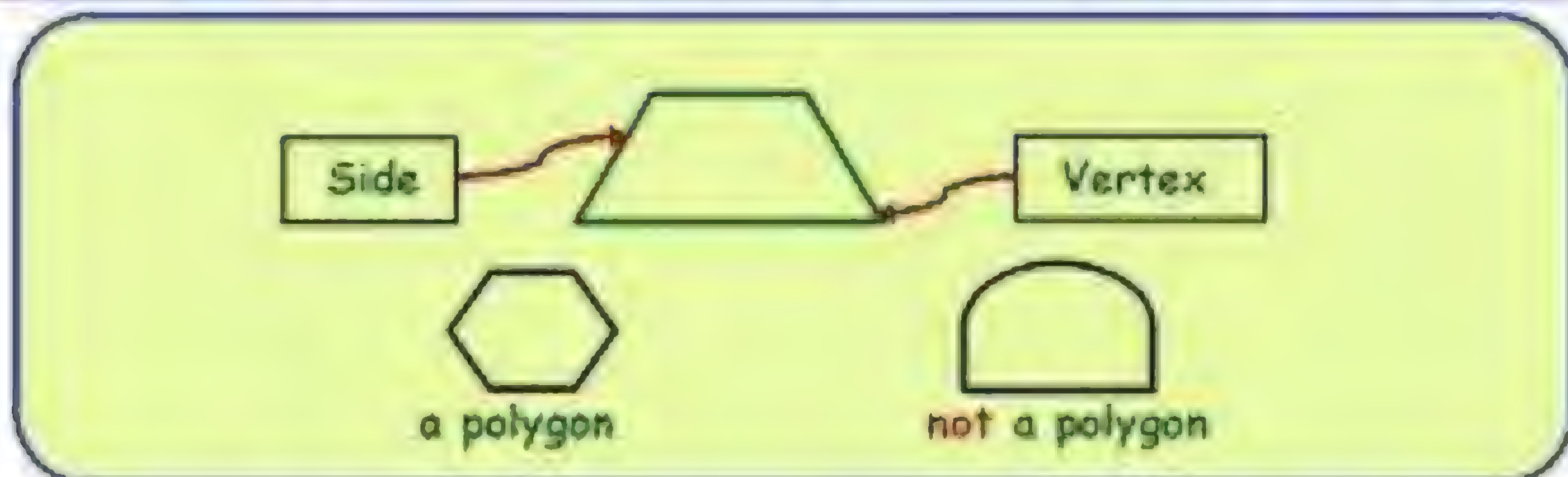
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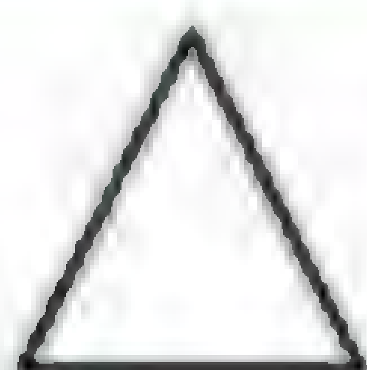
UNIT 3

Geometry and measurement

Lesson 1 The relation between the geometrical shapes

The Polygon is a closed shape formed from three line segments or more

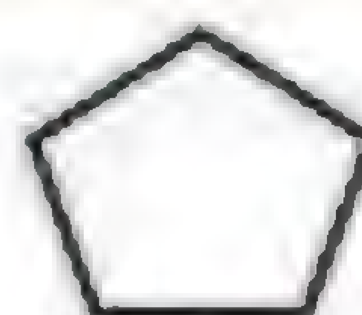




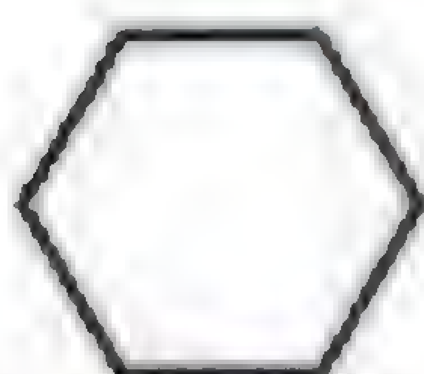
Triangle
3 sides



Quadrilateral
4 sides



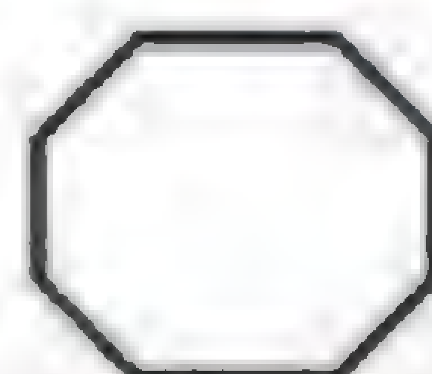
Pentagon
5 sides



Hexagon
6 sides

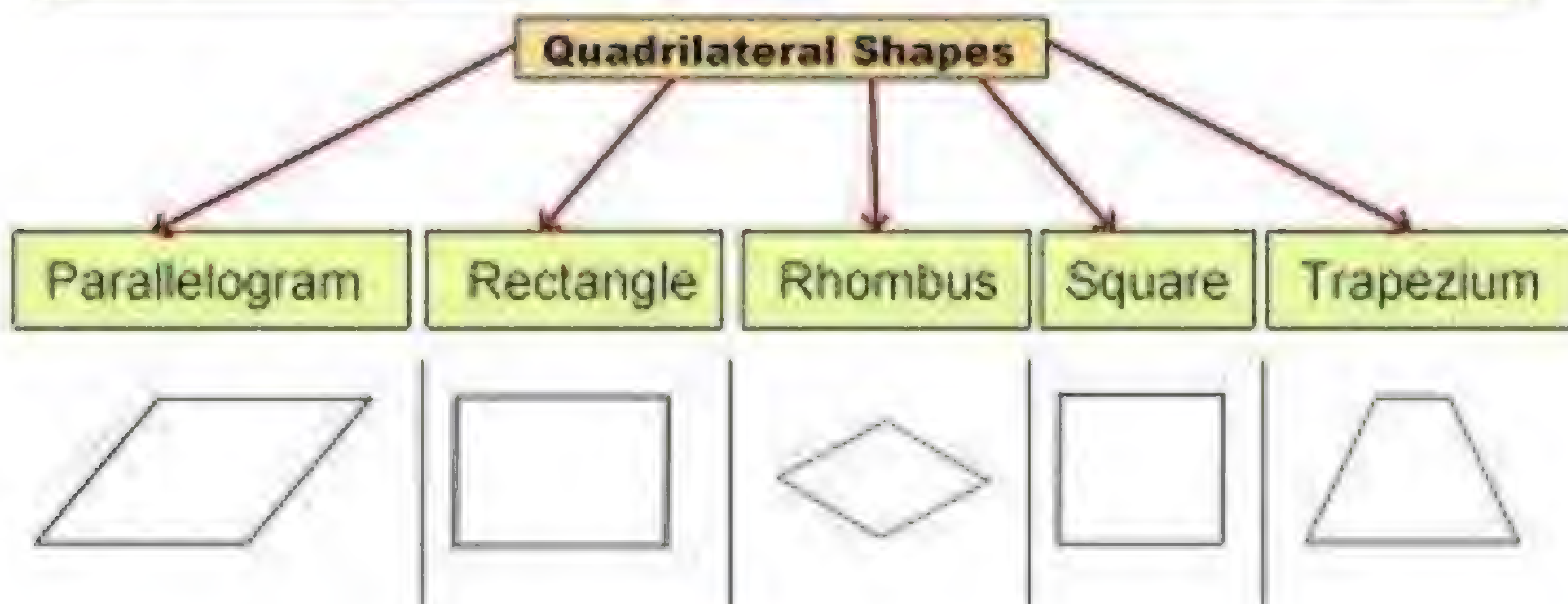


Heptagon
7 sides



Octagon
8 sides

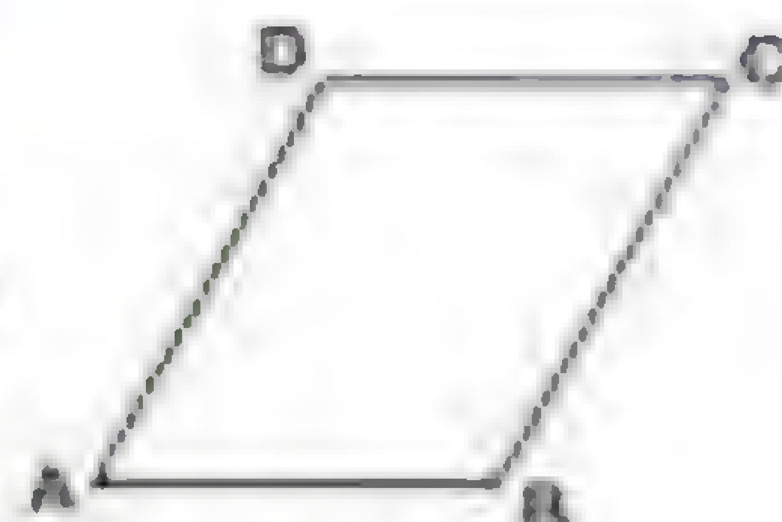
The number of sides of any polygon is equal the number of its vertices and equal to the number of its angles



The quadrilateral Shapes

Quadrilateral	Angles	Sides	Diagonals
Parallelogram	1) 2 acute angles + 2 obtuse angles 2) Each two opposite angles are equal. 3) The sum of any two consecutive angle is 180°	Each two opposite sides are equal and parallel	- Bisect each others
Rectangle	4 right angles	Each two opposite sides are equal and parallel	- Bisect each others - Equal in length
Rhombus	1) 2 acute angles + 2 obtuse angles 2) Each two opposite angles are equal. 3) The sum of any two consecutive angle is 180°	1) All sides are equal in length. 2) Each two opposite sides are parallel	- Bisect each others - Perpendicular
Square	4 right angles	1) All sides are equal in length. 2) Each two opposite sides are parallel	- Bisect each others - Equal in length - Perpendicular
Trapezium	Only a pair of sides are parallel and not equal		

The properties of the parallelogram



Angles

2 acute angles
2 obtuse angles

- Each two opposite angles are equal in measure

$m\angle A = m\angle C$, $m\angle B = m\angle D$

- The sum of any two consecutive (adjecent) angles is 180 °

$m\angle A + m\angle B = 180°$, $m\angle B + m\angle C = 180°$

$m\angle C + m\angle D = 180°$, $m\angle D + m\angle A = 180°$

Sides

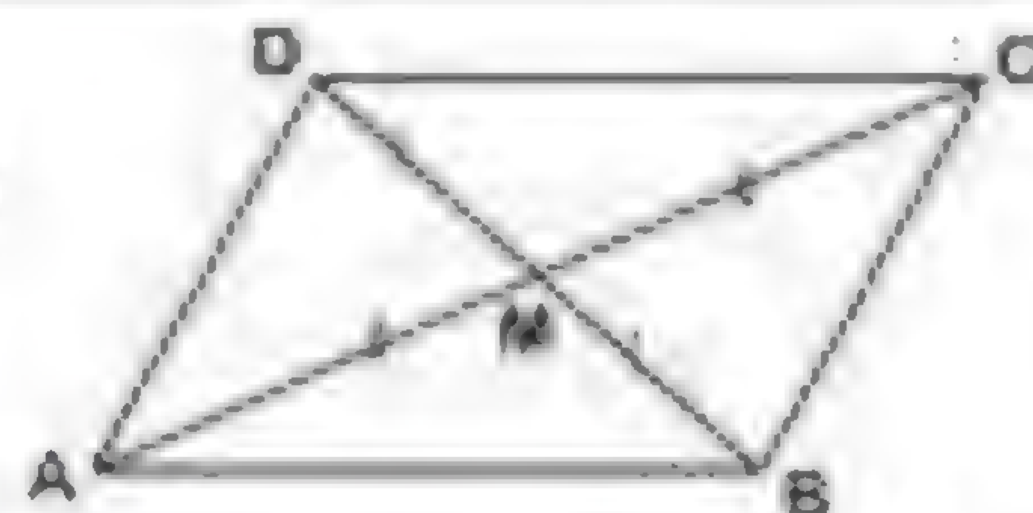


- Each two opposite sides are parallel and equal in length .

AB = CD , BC = AD

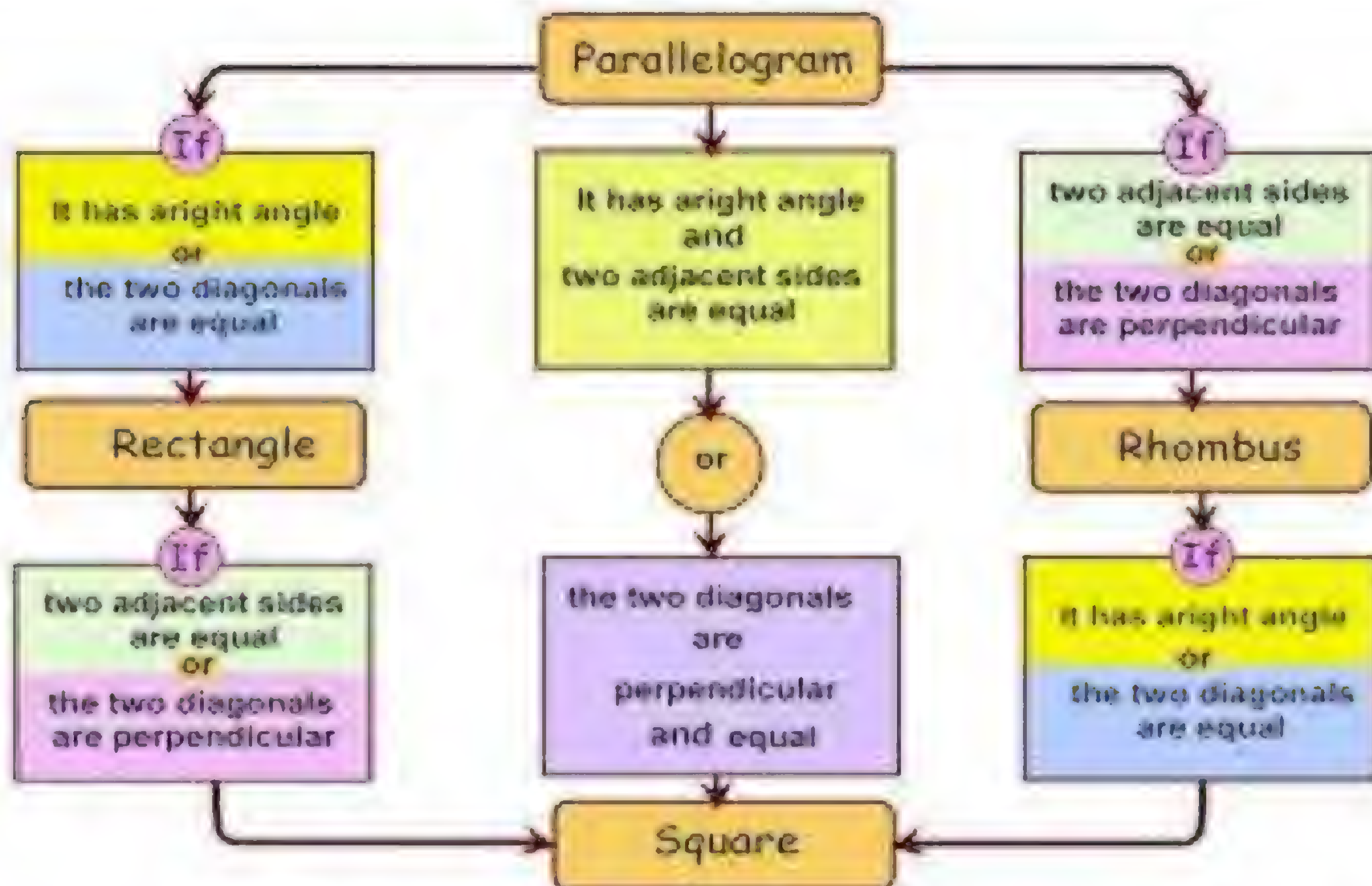
$\overline{AB} \parallel \overline{CD}$, $\overline{BC} \parallel \overline{AD}$,

Diagonals



- The two diagonals bisect each other.

AM = CM , BM = DM





In the opposite figure :

ABCD is a parallelogram in which :

AB = 8 cm. , BC = 6 cm. and m (∠ ABC) = 120°

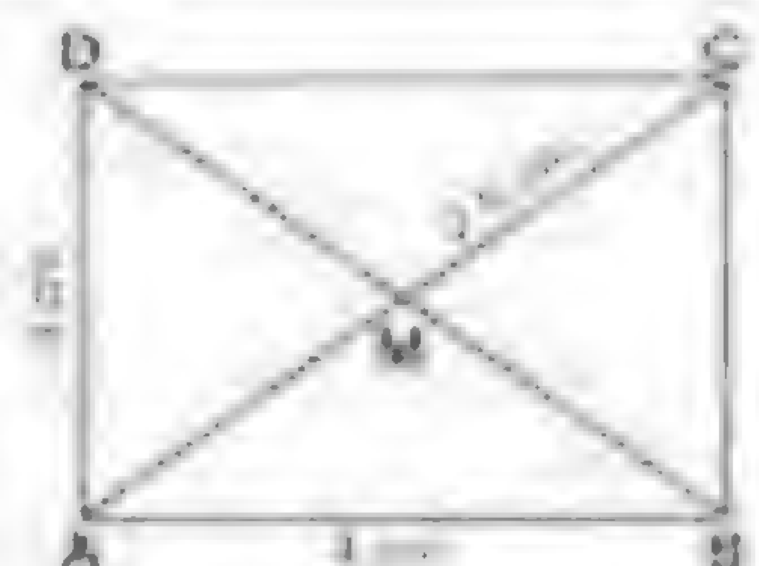
Find without measuring :

1 AD = ... 2 CD = ...

3 m (∠ C) = ...

4 m (∠ D) = ...

5 m (∠ A) = ...



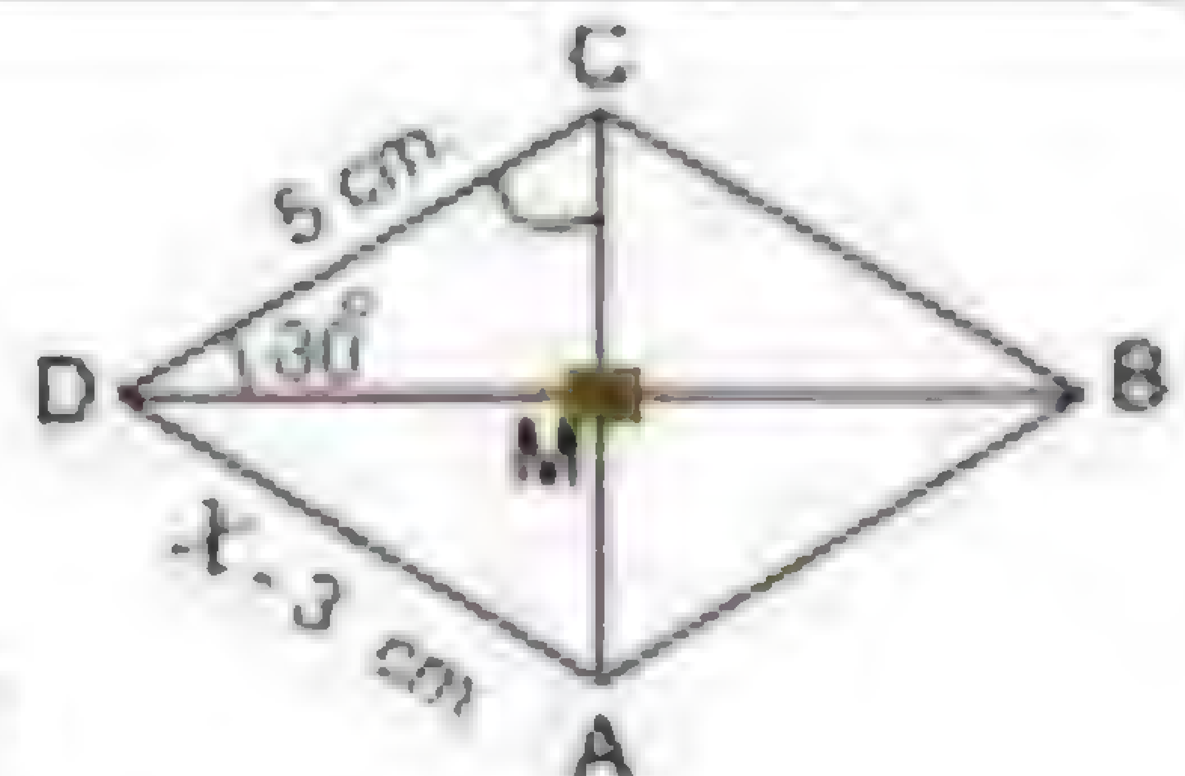
In the opposite figure :

ABCD is a rectangle in which

AB = 4 cm. , AD = 3 cm. and MC = 2.5 cm.

Find without measuring :

1 m (∠ ABC) = ... 2 AM = ... 3 BD = ...



In the opposite figure :

ABCD is a rhombus in which

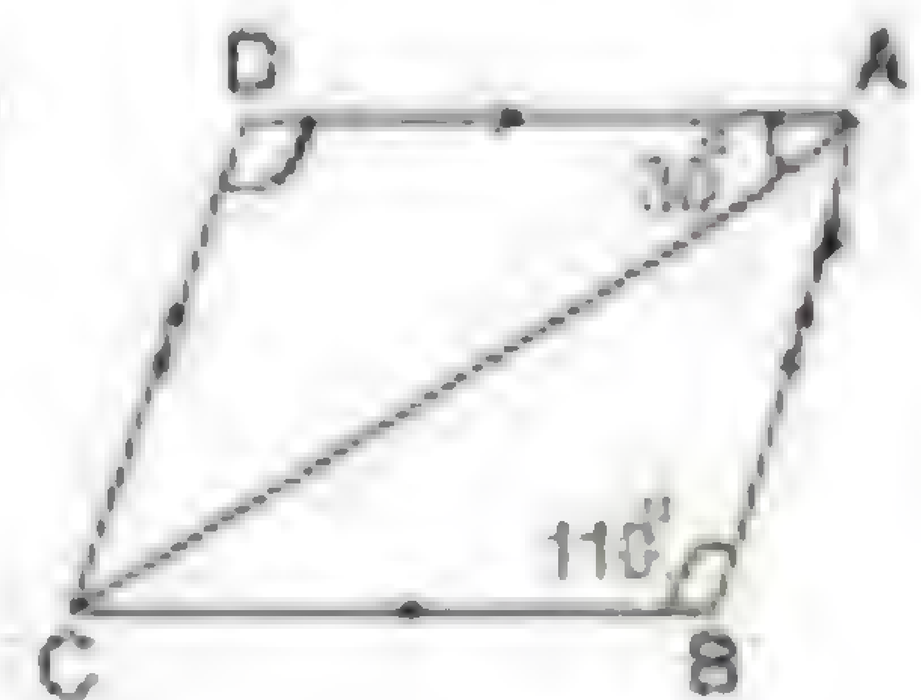
DC = 5 cm. , DA = (X – 3) cm. and

m (∠ BDC) = 30°

Using the properties of rhombus , find :

1 The value of X ....

2 m (∠ MCD) = ...



The opposite figure shows a parallelogram :

in which : m (∠ B) = 110° and m (∠ DAC) = 30°

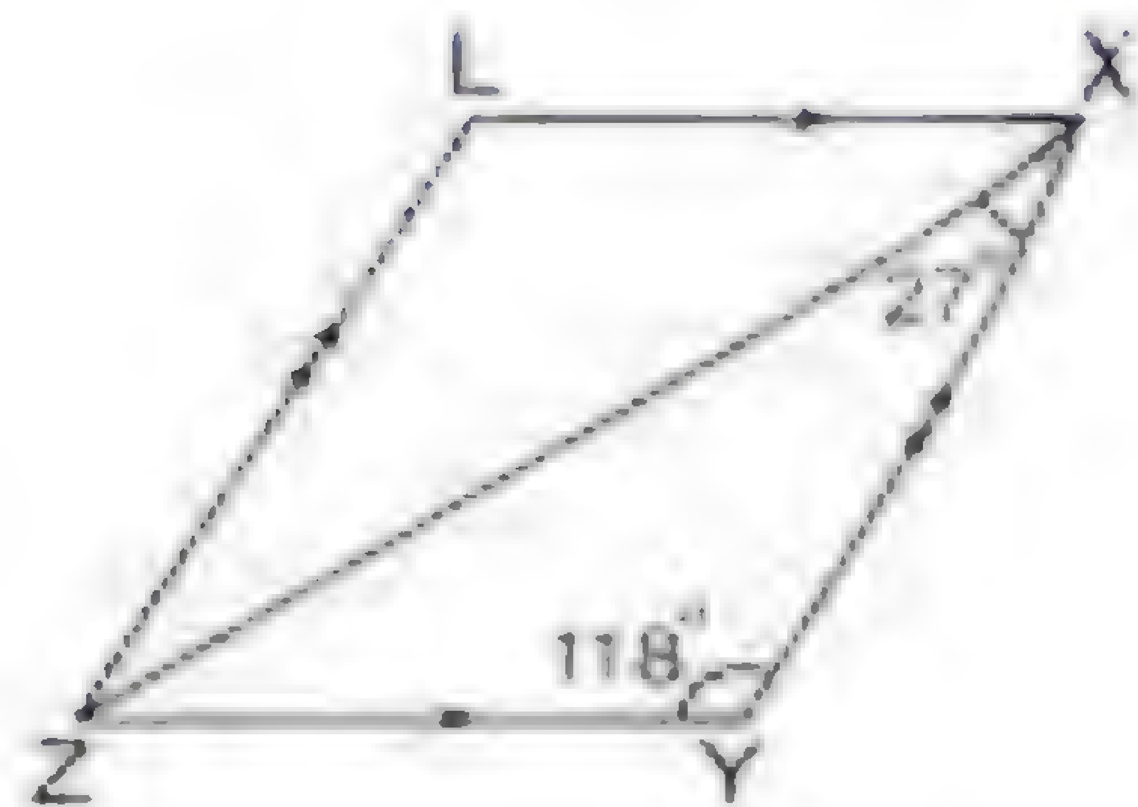
Find : m (∠ D) , m (∠ BAC) and m (∠ ACD)

m (∠ D) = ...

m (∠ BAC) ....

m (∠ ACD) ....

In the opposite figure :



XYZL is a parallelogram in which :

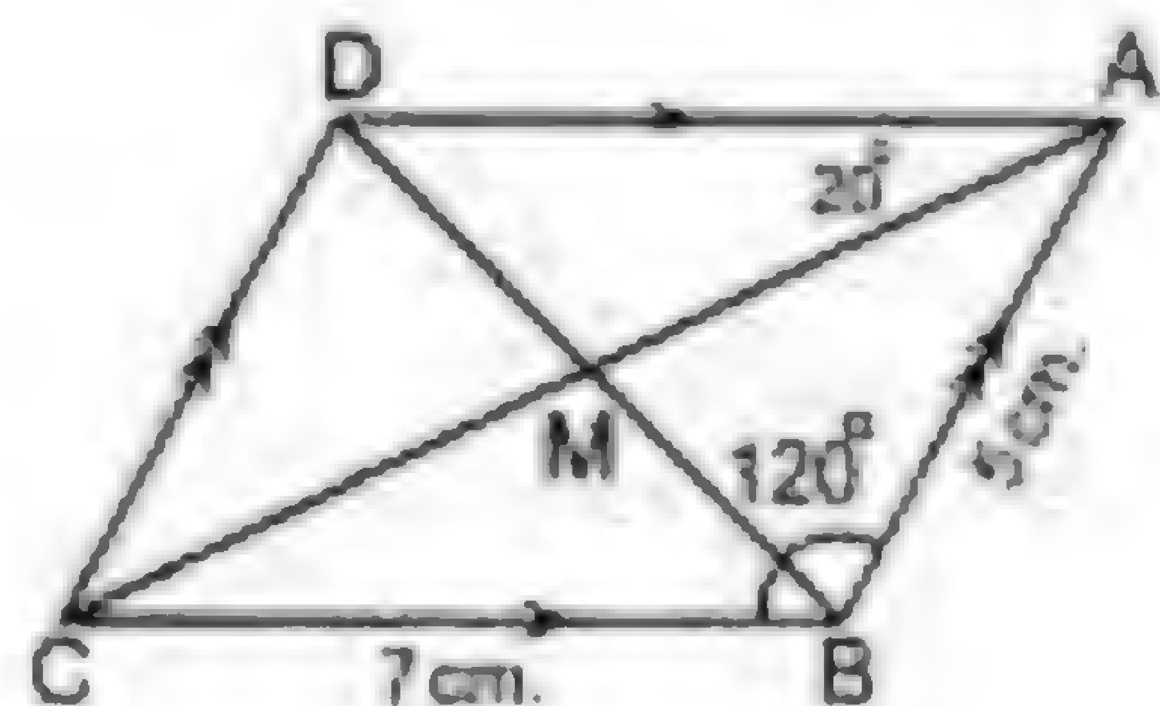
m (∠ Y) = 118° and m (∠ YXZ) = 27°

Find : m (∠ L) and m (∠ LXZ)

m (∠ L) = ...

m (∠ LXZ) = ...

In the opposite figure :



ABCD is a parallelogram in which
AB = 5 cm. , BC = 7 cm. ,
m (∠ ABC) = 120° , m (∠DAC) = 20°
Without using geometrical instruments

Find : m (∠ ADC) ....

m (∠BAC) ....

the length of $\overline{DC}$ .... and the length of $\overline{AD}$ ....

---

complete the following

a) The four sides are equal in length in each of ...., ...

b) The two diagonals are equal in length in each of ...., ...

c) The two diagonals are perpendicular in each of ...., ...

d) The four angles are right in each of ...., ...

e) the two opposite angles are equal in each of ...., ...

.........., ...

f) The two diagonals bisects each ether in each of ...., ...

.........., ...

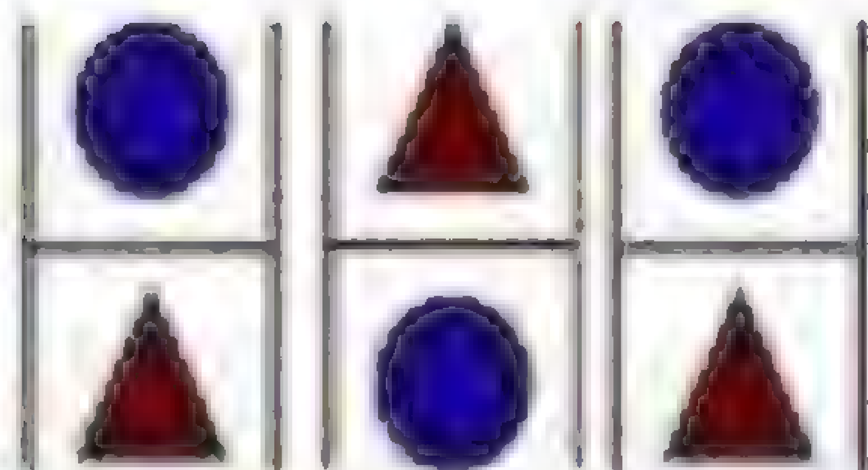
g) The sum of measures of the two consecutive angles equals 180° in each of

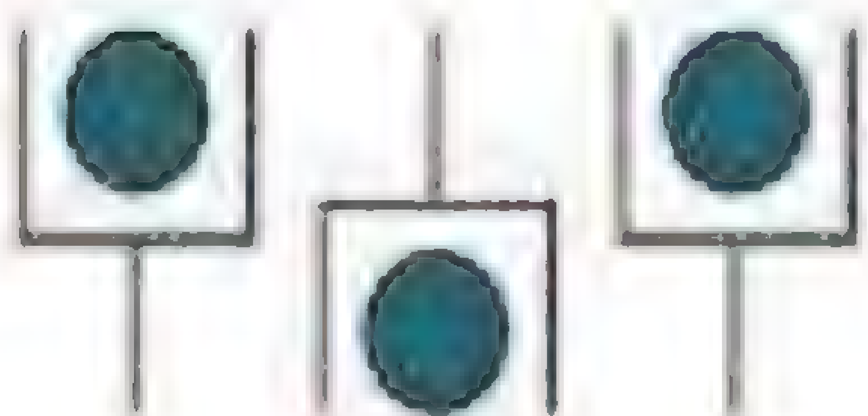
.........., ..., ..., ...

Lesson 2 The visual patterns

Discover the pattern in each case of the following and describe it then complete its repetition twice

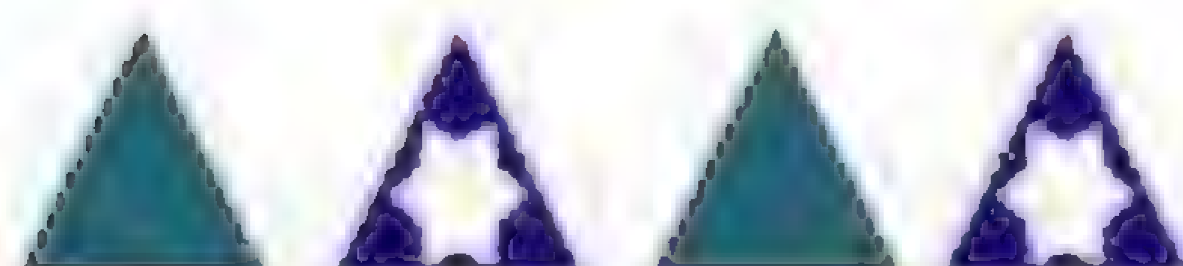

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Lesson 3 Volumes

The Solid is any object that occupies a room in the space

The volume is the magnitude of the room which the solid occupies in the space .

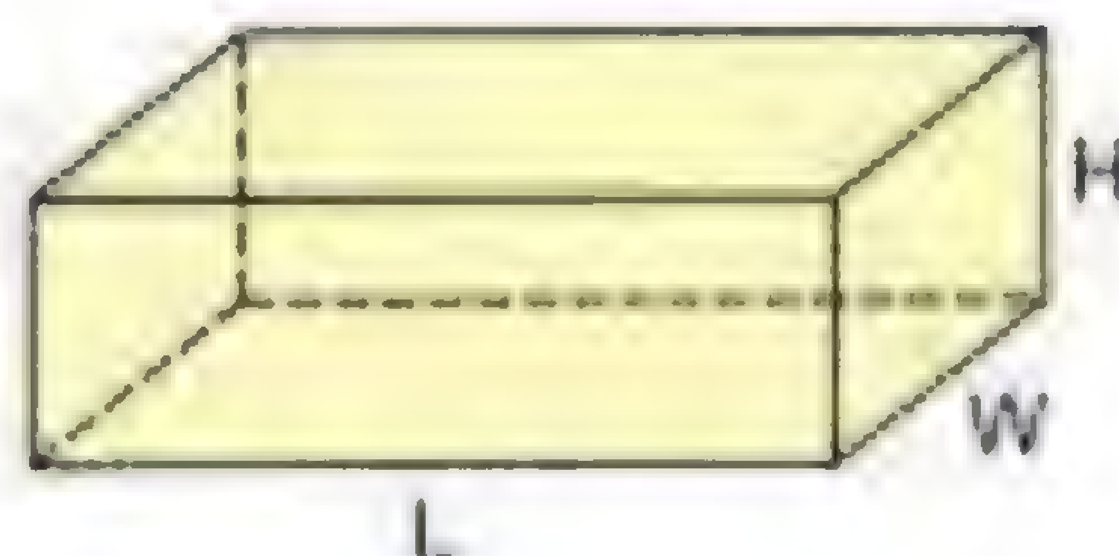
The volume is the number of cubic units which a solid consists of.

The cuboid is a solid which has :

12 edges	8 vertices	6 faces

- each face is a rectangle
- each two opposite faces are parallel and congurent
- the cuboid has 3 dimentions

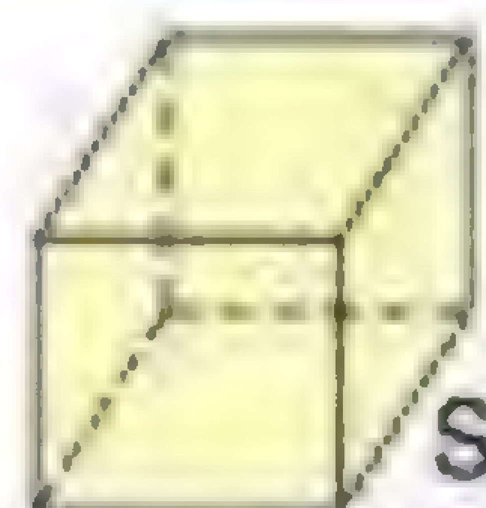
Length (L)
Width (W)
Height (h)



The cube is a solid which has :

12 edges	8 vertices	6 faces

- All edges are eaqual in length.
- Each face is a square.
- All faces are congurent .

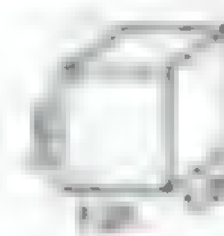


If the dimensions of a cuboid are equal in length ,then it is called cube

The units of measuring volume

The cubic centimetre (cm^3)

It is the volume of cube of edge length that equals 1 cm. This unit is used to measure the volume of a carton of milk , a box of soap , ... etc.



Converting units

$1\ m^3 = 1000\ dm^3$ $\quad$ $1\ dm^3 = 1000\ cm^3$

$1\ m^3 = 1000\ 000\ cm^3$ $\quad$ $1\ cm^3 = 1000\ mm^3$



convert each volume's unit in the following to the opposite volume's unit

$4\ m^3$ = ... = ... dm^3

$300\ mm^3$ = ... = ... cm^3

$0.5\ cm^3$ = ... = ... mm^3

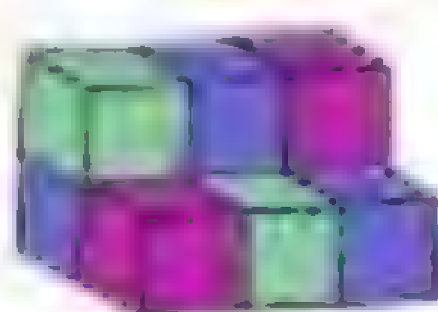
$6500\ dm^3$ = ... = ... m^3

Find the volume of each solid in the following considering the volum's unit is cm^3:



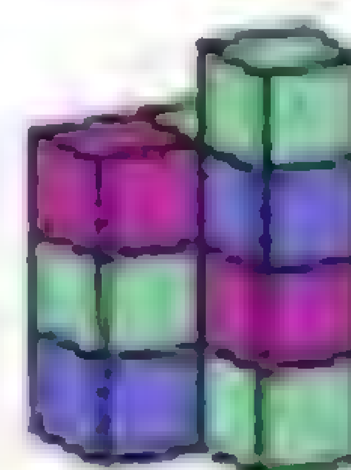
The volume of

The solid = ... cm^3



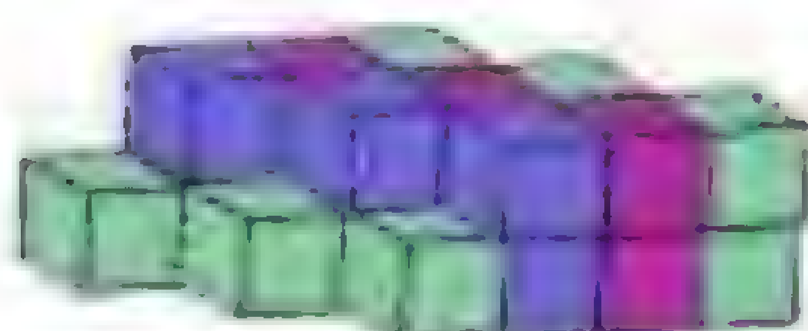
The volume of

The solid = ...cm^3



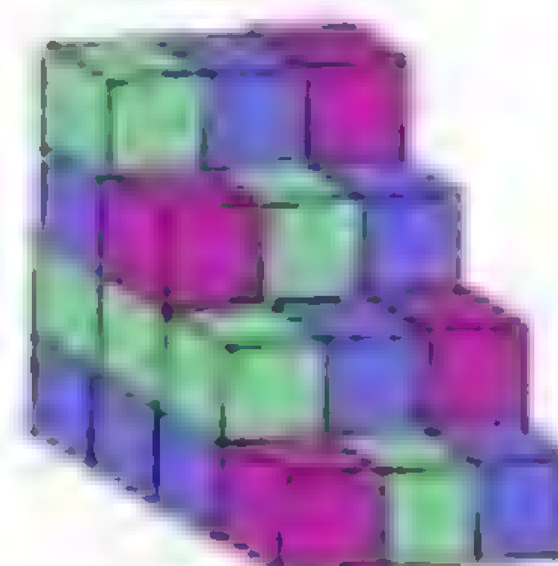
The volume of

The solid = ...cm^3



The volume of

The solid = ... cm^3



The volume of

The solid = ...cm^3

Lesson 4 Volume of the Cuboid

The volume of the cuboid = length × width × height

$V = L \times W \times H$

The volume of the cuboid = base area × height

V = base area × H

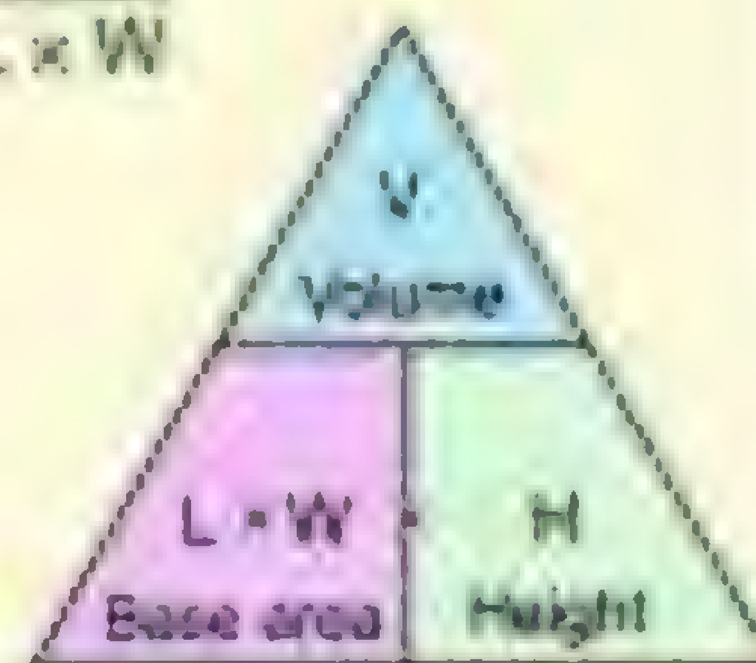


The volume of the cuboid = the product of its three dimensions

Base area = $\frac{\text{volume}}{\text{height}} = \frac{V}{H}$ Height = $\frac{\text{volume}}{\text{base area}} = \frac{V}{L \times W}$

length = $\frac{\text{volume}}{\text{width} \times \text{height}} = \frac{V}{W \times H}$

width = $\frac{\text{volume}}{\text{length} \times \text{height}} = \frac{V}{L \times H}$



All dimensions must be in the same units.

Example

Find the volume of a cuboid with lenght 8 dm. width 45 cm and height 200 mm.

The solution

8 dm = 8 X 10 = 80 cm.   200 mm = 200 ÷ 10 = 20 cm

The volume of cuboid = L X W X H

= 80 X 45 X 20 = 72 000 cm^3

The dimensions of a cuboid are 4 cm. , 3 cm. and 8 cm. Find its volume.

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Which is greater in volume : a cuboid of dimensions 7 cm. , 6 cm. and 8 cm. or a cuboid of base area 30 cm^2 and its height is 12 cm.

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A container has a square base of side length 8 cm.
What is the height of the box if its volume is 384 cm^3 ?

The volume of a cuboid is 720 cm^3 and its height is 9 cm. Find its base area

Example.

A box in the shape of cuboid with dimentions 300 , 200 and 100 cm. it wanted to fill it with boxes in shape of cuboids with dimentions 15 , 8 and 10 cm.
Find the number of small boxes

The solution

The volume of great box = L X W X H = 300 X 200 X 100 = 6 000 000 cm^3

The volume of small box = L X W X H = 15 X 8 X 10 = 1200 cm^3

The number of boxes = 6 000 000 ÷ 1200 = 500 boxes

A box is in the shape of a cuboid of dimensions 30 cm. , 21 cm. and 6 cm.
If it is filled with cuboid-shaped pieces of sweets of dimensions 5 cm. , 3 cm. and 2 cm. , find the number of pieces of sweets.

A swimming pool is in the shape of a cuboid , its base is of length 60 metres and its width is 40 metres.
Find its depth if 3 600 m^3 of water fill this swimming pool

Lesson 5 Volume of the Cube

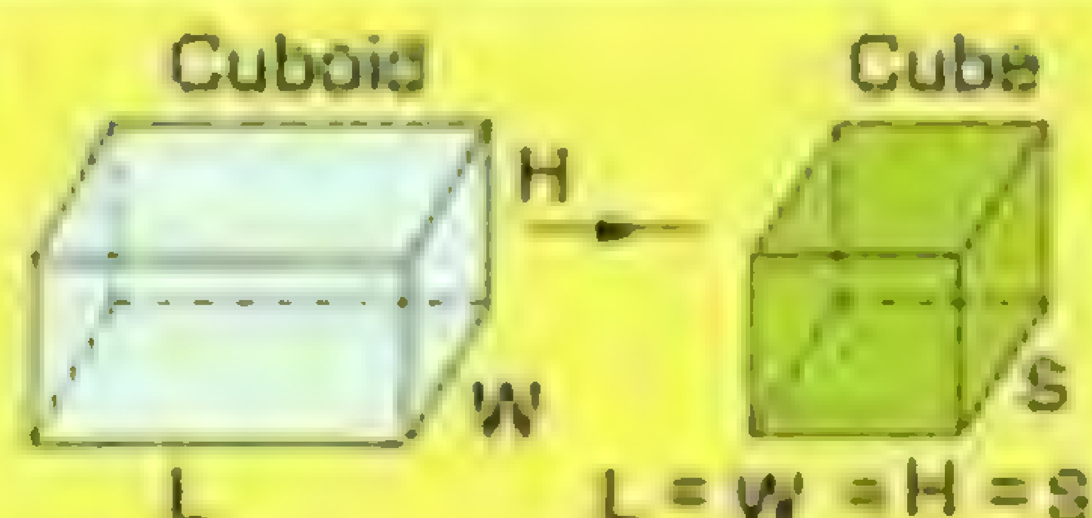
The cube is a solid which has :

12 edges	8 vertices	6 faces

- All edges are eaqual in length.
- Each face is a square.
- All faces are congruent .

Since , the cube is of equal dimensions and it is a special case of the cuboid

(L = W = H = edge length)



Then , the volume of a cube = the edge length × itself × itself

$V = S \times S \times S$

What is the volume of a cube of edge length 4 cm. long ?

....

....

Find the volume of the cube if the perimeter of one of its faces is 28 cm.

....

....

....

The total area of a cube = 150 cm² **Calculate its volume.**

....

....

....

....

....

The sum of lengths of all edges of a cube is 108 cm. Calculate its volume.

....

....

....

Which is greater in volume : a cube of edge length 10 cm. or a cuboid of dimensions 15 cm. ، 7 cm. and 10 cm. ?

Then find the difference between their volumes.

....

....

....

....

....

A metallic cube of edge length 12 cm. long was melted and changed into a number of equal cuboids of dimensions 8 cm. ، 2 cm. and 9 cm. each.
Find out the number of the cuboids.

....

....

....

....

....

A piece of metal is in the shape of a cube of edge length 9 cm. was melted to be a cuboid of length 12 cm. and of width 9 cm.

Find the height of the cuboid.

....

....

....

....

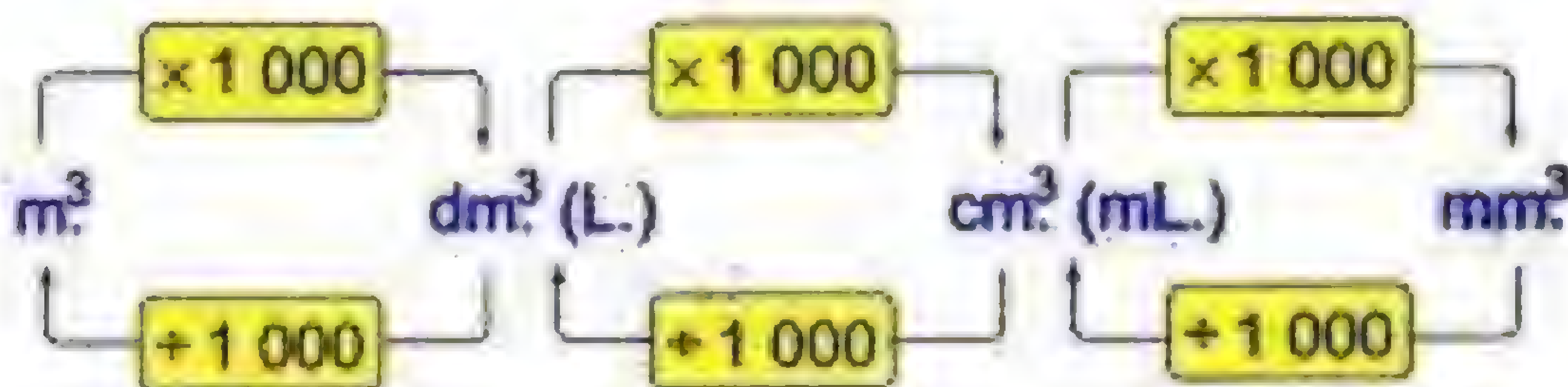
Lesson 6 The capacity

The capacity :

It is the volume of the inner space of a hollow solid.

The relation between the units of volume and the units of capacity

The litre (L.)		millilitre (mL.)
1 litre = 1 dm^3	1 litre = 1 000 millilitre	1 millilitre = 1 cm^3



Convert each of the following into litres :

[1] 6 500 cm^3 = ...

[2] 0.46 m^3 = ...

[3] 7.64 dm^3 = ...

[4] 750 mL. = ...

Convert each of the following into cubic centimetres :

[1] 0.006 m^3 = ...

[2] 3.25 litres. = ...

[3] 5 700 mm^3 = ...

[4] 2.5 mL. = ...

Convert each of the following into cubic metres :

[1] 56 dm^3 = ...

[2] 84 000 cm^3 = ...

[3] 6.9 litres. = ...

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A swimming pool in the shape of a cuboid whose internal dimensions are 40m, 30m, 1.8m Find its capacity in litres

....

....

A cube shaped vessel, its internal edge length is 30cm. it is filled with food oil.

a- calculate the capacity of the vessel.

b- If the price of one litre of food oil is 9.5 pounds calculate the price of all oil.

....

....

....

....

A container has 12 litre of honey. It is wanted to put them in smaller vessels (bottles) the capacity of each of them is $400cm^3$ calculate the number of bottles which is needed for that.

....

....

A patient take a medicine spoon of capacity 3ml daily in the morning and at evening. After how many days does the patient take $240\ cm^3$ from this medicine.

....

....

A container in the shape of a cuboid, its internal dimensions are length = 25cm, the width = 30 cm. The height = 42cm An amount of solar is Put in it, its height = $\frac{1}{3}$ the height of the container. calculate

a- The volume of solar in the container

b- The total price of solar in the container if the price of one litre of solar = 1.2 pounds.

....

....

....

....

Unit 4

Statistics

Lesson 1 Kinds of statistical data

You notice that the responses of this survey contains two kinds of data :

1. Descriptive data which we use to describe the conditions of individuals using words such as : Name , qualification , gender , marital status , ...
2. Quantitative data which consists of numbers to represent a certain phenomenon such as : age , weight , height , ...

Remark

Data base : is some quantitative and descriptive data of number of persons or establishments.

Lesson 2 Collecting descriptive data

Example

Youssef was waiting for his school bus , then he decided to record the colours of the first 30 cars passing in front of him which were as follows :

white - green - red - red - blue - black - red - white - blue - black - blue - white - red - black - blue - green - white - blue - red - black - white - blue - white - red - green - white - red - white - black - silver

• Form the simple frequency table for this data , then answer the following

1. What is the most common colour in this neighbourhood and what is its percentage ?
2. What is the least common colour in this neighbourhood and what is its percentage ?

The solution

Solution • We form the tally frequency table :

Colour	Tally	Frequency
White	卌 |||	8
Blue	卌 |	6
Green	|||	3
Black	卌	5
Red	卌 ||	7
Silver	|	1
Total		30

- We omit the tally column to get the simple frequency table :

Colour	White	Blue	Green	Black	Red	Silver	Total
Frequency	8	6	3	5	7	1	30

1 The most common colour is white and its percentage is $\frac{8}{30} \times 100\% = 26\frac{2}{3}\%$

2 The least common colour is silver and its percentage is $\frac{1}{30} \times 100\% = 3\frac{1}{3}\%$

To form the class representatives committee, 5 students (Ramy, Sameh, Mazen, Fareed and Samir) are nominated as candidates and the rest of the class will vote to elect the class leader, their votes are as follows :
Ramy - Sameh - Ramy - Fareed - Samir - Mazen - Sameh - Fareed -
Sameh - Sameh - Mazen - Ramy - Sameh - Ramy - Samir - Mazen -
Ramy - Fareed - Mazen - Fareed - Ramy - Ramy - Mazen - Samir - Mazen

- Record this data in the following tally frequency table :

Student	Tally	Frequency
....	....	....
....	....	....
....	....	....
....	....	....
....	....	....
Total		....

- the simple frequency table :

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Lesson 3 Collecting quantitative data

Example

The following data shows the marks of 30 pupils of 6th primary grade in maths where the maximum mark is 10 marks :

8	7	7	7	5	4	8	6	6	5
5	6	6	7	7	9	7	6	7	7
6	7	7	8	5	6	8	9	4	8

From these unarranged data, is it easy to answer questions as :

- What is the mark that most of pupils got ?
- How many pupils got 7 marks ?
- How many pupils got 3 or 4 marks ?

frequency table as the following :

Marks	Tally	Frequency
4	//	2
5	////	4
6	~~////~~ //	7
7	~~////~~ ~~////~~	10
8	~~////~~	5
9	//	2
Total		30

Marks	4	5	6	7	8	9	Total
Frequency	2	4	7	10	5	2	30

Remarks

- The difference between the maximum and the minimum value of the given data is called the range of this data.
- The difference between the upper limit and the lower limit of the set is called the length of this set.
- Number of sets = $\frac{\text{the range}}{\text{the length of the set}}$

The following data shows the marks which 54 pupils got in maths , where the maximum mark is 60 marks :

42	41	43	27	$37\frac{1}{2}$	48	45	58	24	43	50
48	54	36	59	45	40	45	51	35	$39\frac{1}{2}$	46
38	40	36	45	35	30	20	36	40	50	54
47	47	47	46	39	$44\frac{1}{2}$	42	$42\frac{1}{2}$	56	48	45
29	55	30	25	34	42	32	51	28	44	

Form a frequency table of sets using the sets :

(20 – , 25 – , 30 – , ... and 55 –) , then answer the following questions :

a How many pupils got less than 30 marks ?

And what is their percentage ?

b How many pupils got 50 marks or more ?

And what is their percentage ?

Solution

Sets of marks	Tally	No. of pupils (Frequency)
20 –	//	2
25 –	////	4
30 –	////	4
35 –	𝍸 ////	9
40 –	𝍸 𝍸 //	12
45 –	𝍸 𝍸 ///	13
50 –	𝍸 /	6
55 –	////	4
Total		54

Sets of marks	20 –	25 –	30 –	35 –	40 –	45 –	50 –	55 –	Total
No. of pupils (Frequency)	2	4	4	9	12	13	6	4	54

[a] The pupils who got less than 30 marks are : 2 + 4 = 6 pupils.

and their percentage = $\frac{6}{54} \times 100\% = 11\frac{1}{9}\%$

[b] The pupils who got 50 marks or more are : 6 + 4 = 10 pupils.

and their percentage = $\frac{10}{54} \times 100\% = 18\frac{14}{27}\%$

The following data represent the weights of 50 pupils in kg. :

52	35	40	57	43	40	36	49	43	58
47	48	51	30	59	36	45	41	44	37
42	54	38	55	42	47	46	34	53	44
47	32	41	62	50	39	58	46	43	49
40	41	64	44	54	45	38	40	48	41

[a] Form the frequency table using the following tables :

The tally freque. .y table

Sets	Tally	Frequency
30 –		
35 –		
40 –		
45 –		
50 –		
55 –		
60 –		
Total		50

The frequency table of sets

[b] Complete the following :

- The least weight of pupils in the class is from .... to ....
- The set of weights that contains the greatest number of pupils is from .... to ....
- The number of pupils whose weights are less than 45 kg. is .... and their percentage is ....

Lesson 4 Representing the statistical data by the frequency curve

The following table shows the frequency distribution of marks of 40 pupils in the mathematics exam :

Sets	10 –	20 –	30 –	40 –	50 –	Total
Frequency	5	7	12	9	7	40

Represent these data by the frequency polygon. Frequency curve

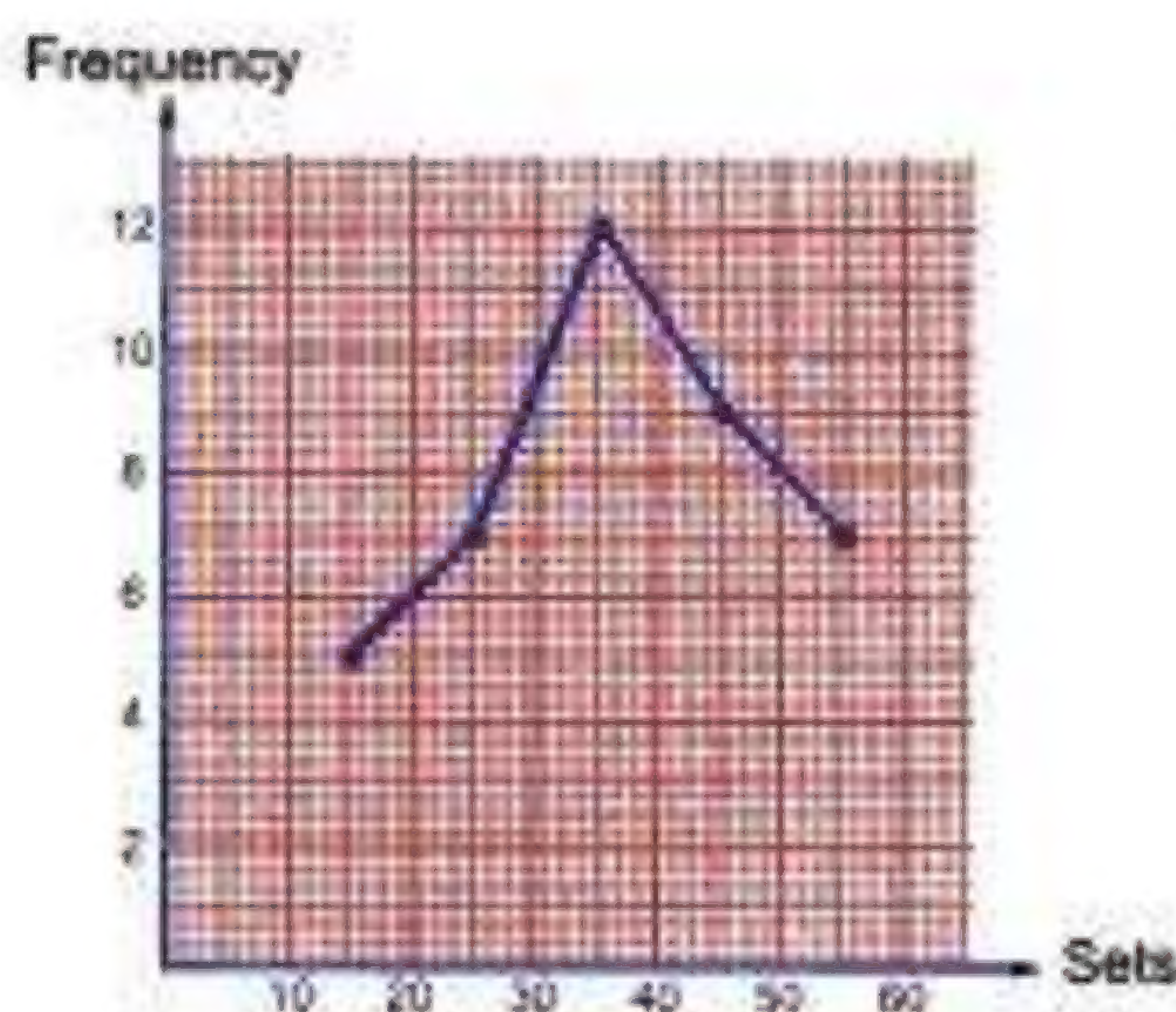
Solution

the centre of each set using the relation :

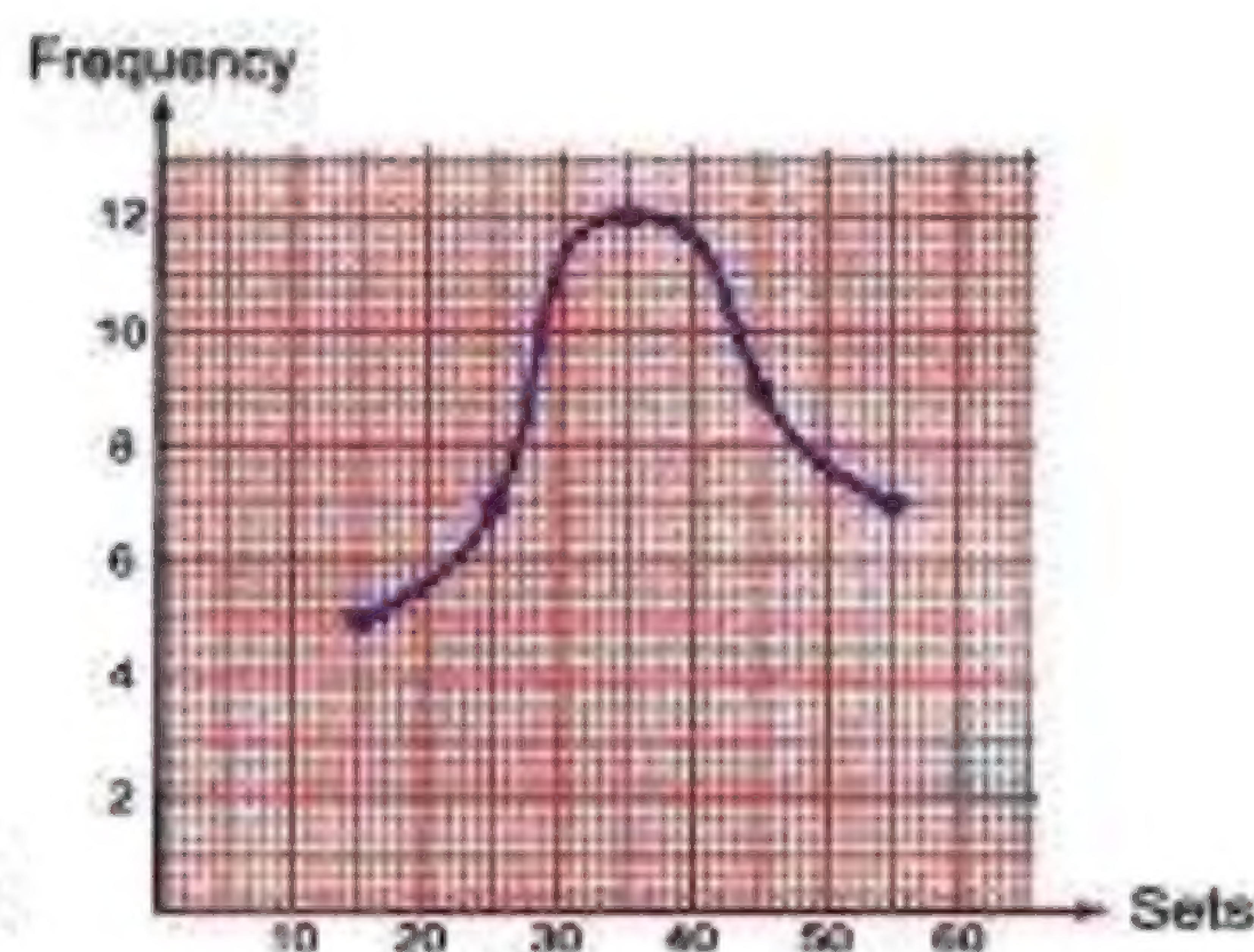
$$\text{Centre of the set} = \frac{\text{lower limit} + \text{upper limit}}{2}$$

i.e. The centre of the set (10 –) is $\frac{10 + 20}{2} = 15$

Sets	10 –	20 –	30 –	40 –	50 –	Total
	15	25	35	45	55	
Frequency	5	7	12	9	7	40



frequency polygon.



Frequency curve

The following data represents the marks in the mathematics test for students in one classroom :

Sets	0 –	10 –	20 –	30 –	40 –	50 –
Frequency	6	10	15	20	8	4

a Draw the frequency curve for this distribution.

b Complete :

[1] The number of students whose marks are less than 20 = ...

[2] The number of students whose marks are 40 and more = ...

The following table shows the number of flights done in Cairo airport in the period from 12 at noon till 8 in the morning of the next day :

Time	12 am –	4 pm –	8 pm –	12 pm –	4 am –	Total
Number of flights	32	41	42	19	13	147

Represent these data by frequency curve, then answer the following questions :

a In what time is Cairo Airport most crowded ?

b In what time is Cairo Airport the least crowded ?

c What is the percentage of the number of flights coming to Cairo Airport in the period from 12 at noon till 4 pm ?

d What is the percentage of the number of flights coming to Cairo Airport after 12 am ?